

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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Boilers for Water Works.

For a long time the boilers used in connection with the celebrated pumping engine of the Cornish mines held supremacy in the popular estimation as completely as did the engine with which they were associated. They were designed to burn coal very slowly upon a grate of large dimensions, combined with an extraordinary amount of heating surface. They were cylindrical in form, with a large flue running the whole length, one end of which constituted the fire-box. The gaseous products, after leaving the fire, traveled through the remainder of this large flue, or through two smaller flues, which were sometimes substituted, to the rear of the boiler, then back to the front end under one half of the shell, and again to the rear under the other half on its way to the chimney. A very slow rate of combustion was insisted upon, and the greatest care taken to prevent radiation.

given quantity of steam at 100 lbs. per square inch as to make it at 50 lbs.

Moreover, the initial and inevitable losses connected with the use of steam bear a smaller proportion to the high than to the low pressure. A non-condensing engine expends about 15 lbs. per square inch uselessly in overcoming atmospheric pressure against the piston. In such a case, if the working pressure were but 20 lbs. above zero, very little would be left for useful propulsion. But if the working pressure were increased to 100 lbs., the percentage of loss adverted to would be very much reduced. Similar laws apply to all engines, whether condensing or non-condensing, and constitute the most important arguments in favor of high boiler pressures.

But while giving them due consideration, the more important point is the safety and durability of the machinery employed. One of the most distinguished hydraulic engineers of the day says, upon the most careful con-

The fact that the most active part of the fire is expended under the body of the boiler is a good feature of protection in case of accidental deficiency of water, as the upper tubes, which are the first to be bared, are not exposed to direct heat. The cylindrical form is the very best of all forms, and the numerous tubes operate as longitudinal ties between the two flat heads. It is difficult to imagine anything in the way of a boiler more simple, strong or durable. The ends of the tubes are easily accessible, and the ordinary deposit of sediment can be conveniently removed.

The setting is double, with exterior expansion walls inclosing an air space. It is a rare thing for these settings to suffer materially from cracking or displacement, while the protection against loss of heat from radiation is almost complete. When combined in pairs or sets for duplicate service, these boilers are furnished with entirely independent steam pipes, water pipes and feeding connections, to allow of the use of

that, on the scale of a thousand horse-power, the interest would amount to more than the saving of fuel.¹⁹ As that was at a time when coal was several dollars per ton higher than it is at present, the showing in favor of such boilers as those we speak of would be much greater.

Since the day of the tests named above, the last-named boiler has held its place in the first rank, when properly proportioned and managed. It is not a good boiler under other circumstances, for it will not bear crowding.

Boilers of this pattern are in very general favor in the Eastern States. They are used both for large and small powers by machine shops and factories. As the cost of coal is a heavy item in the cost of power, only the cheapest and most economical forms of boiler can be used successfully. These boilers work well when of comparatively small size, and we have some modified forms of them which could be set almost like portable boilers. The allowance of heating sur-

public attention, it is well to remember that the best result attainable from the combustion of a pound of pure carbon, in a laboratory experiment, is set down by good authority at 15 pounds, nearly. This does not leave much in the way of improvement upon such boiler practice as we have been considering, after deducting 15 per cent. from the value of the coal for ashes, clinker and waste.

It must also be remembered that the difference between a good and a poor fireman will often amount to from 30 to 40 per cent. in the amount of fuel used; consequently, when parties begin to boast of a very high economy, and promise remarkable savings in fuel, it is safe to remember that the fireman can make greater differences in the working of almost any apparatus than extravagant inventors usually claim.

One of the most difficult of all experiments, and perhaps the most uncertain in its result, under different conditions of man-

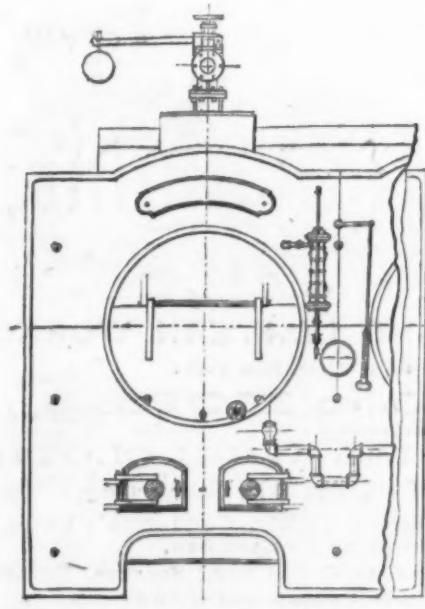


Fig. 1.—Elevation of Front End of Boiler Setting.

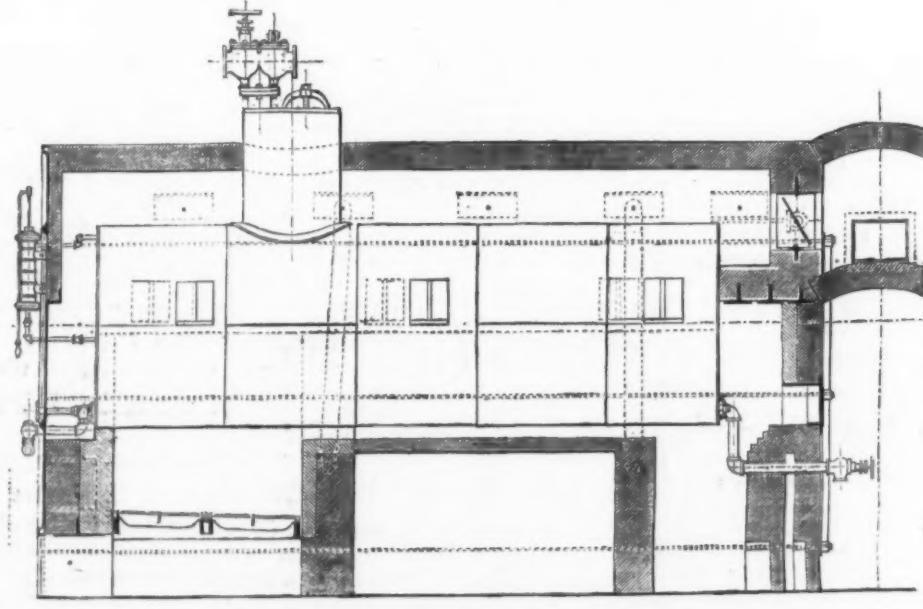


Fig. 2.—Longitudinal Section through Brickwork, showing Arrangement of Flues and Method of Making Connections.

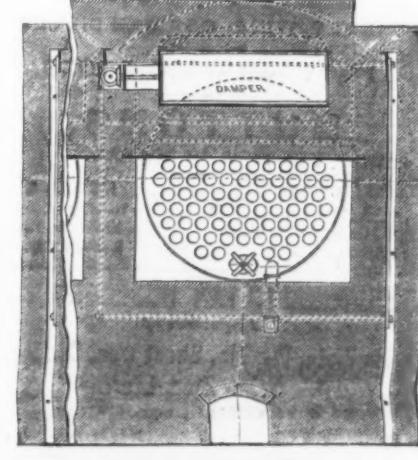


Fig. 3.—Cross Section through the Back Connections, showing Damper, Rear End of Boiler and Air Spaces in the Brickwork.

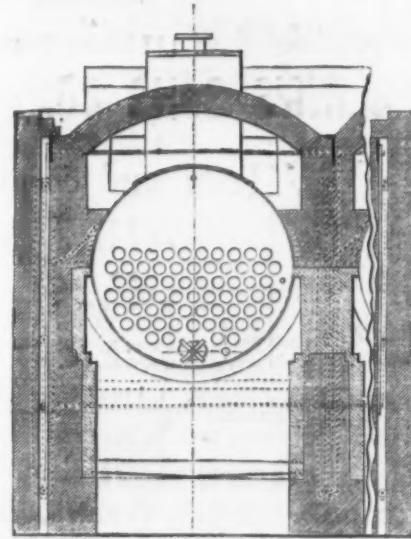


Fig. 4.—Cross Section of Brickwork through Center of Furnace, giving Section of Flues, and showing Front End of Boiler.

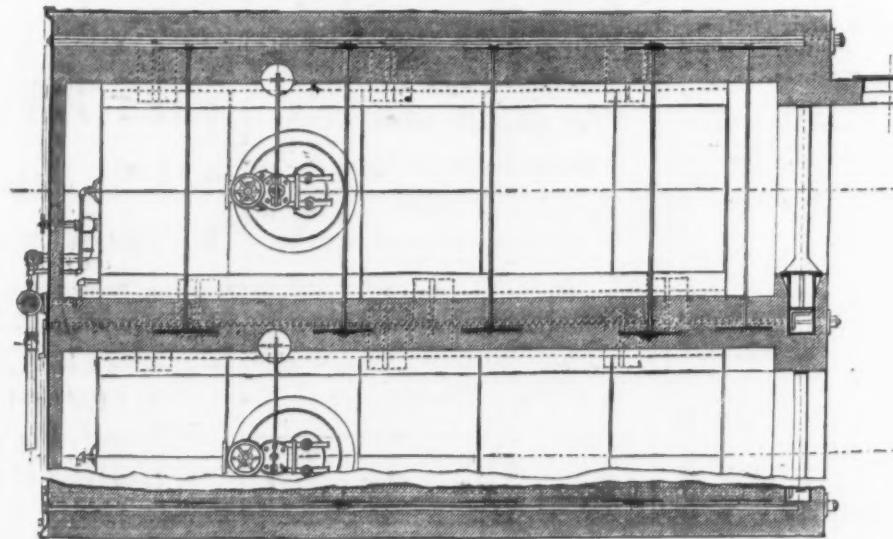


Fig. 5.—Top View of Boiler and Horizontal Section through Brickwork on Line of Ties.

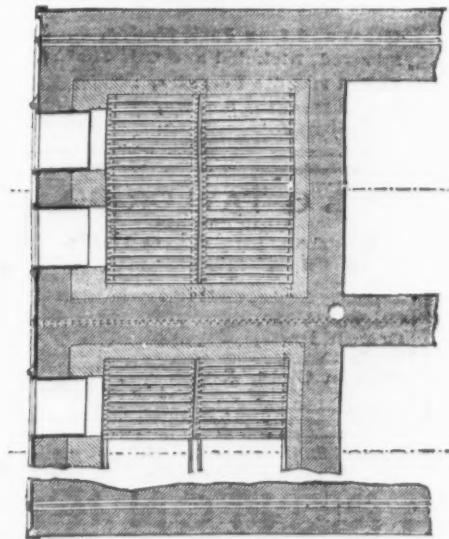


Fig. 6.—Horizontal Section through Brickwork on Line of Grate.

But although very efficient and economical in the use of fuel, the boiler was objectionable in its form and expensive in proportion to the fire surface exhibited. For this country a boiler of this kind is out of the question in any but the largest works, and even in them it is not desirable, for subsequent practice has fully demonstrated that its claims to exclusive preference are by no means tenable. Whatever form may be adopted, the considerations of safety, steadiness of action and durability are so controlling as almost to preclude the use of any not conspicuous for these characteristics.

As to the pressure of steam under which it is desirable to work, it is doubtless true that a boiler can be made to withstand 100 lbs. per square inch as well as 40 lbs. But it is also true that the tendency is to take more or less risk and run closer to the margin of safety, rather than to increase weight and cost to the full degree required for increased pressures; and whether from prejudice or ideas deduced from general observation, there is certainly a feeling of increased responsibility in the mind of almost any careful man called upon to manage large boilers working under unusually high pressures. The gain in their results from the fact that twice as much coal is not theoretically required to make a

sideration of the subject, that he has not been able to see anything in the results shown as attainable, to warrant departure from very conservative and moderate standards.

Undoubtedly some increment of duty and some reduction in size and cost of engines might be gained by the use of steam at higher pressures, but not enough to justify the practical sacrifices which their realization seems to demand.

In this gentleman's very extensive practice the boiler almost exclusively adopted has been the form known as the return tubular boiler, of which we give several drawings. In his practice the largest diameter he has yet employed is 6½ feet, with 4-inch return tubes, 18 feet long, limited to an extreme working pressure of 60 lbs. per square inch. The fire first passes under the boiler, returning through the tubes, and then over the top of the boiler into the chimney, as shown in the drawing: or else dispenses with the top return, and enters the chimney located at the front of the boiler.

As the heat is effectually withdrawn by the passage of the gases through the flues, this top return has no appreciable effect in sur-

charging the steam. It is frequently inconvenient to locate the chimney at the front end of the boiler, and this compels the top return arrangement in many cases.

either one during the repairs of the other or others.

The evaporative results obtained by these boilers, as compared with those from some of the well-known standard forms of boilers, are worth attention.

The report of experts to the Brooklyn water works in 1857 and 1859 dealt carefully with this subject, and gave the following results, which have always been considered good standards for comparison:

Hartford Water Works.—Drop-flue boilers, 10.43 lbs. of water evaporated per lb. of coal from temperature of 100 degrees.

Jersey City Water Works.—Cornish boilers, 10.02 lbs.

Cambridge Water Works.—Return tubular boilers. Not exactly stated, but about 10 lbs.

Better results than these are possible, it is true, but they would probably cost more than they would be worth. This was well illustrated by a reply made by Mr. Root, the well-known boiler maker, some years ago. In answer to the question whether he could build a boiler which should greatly exceed a certain given duty, he said it could be done, and after a few minutes figuring upon paper, added, "The apparatus for evaporating another pound or pound and a half of water for each pound of coal would cost so much

face in the Cornish practice was oftentimes as high as 50 square feet per actual horse-power of 33,000 lbs., and it was very commonly 30 or 40. But 22 square feet, not counting the top return surface, is ample allowance per horse-power in the return tubular boiler, the average activity of the fire surface being considerably greater than in the Cornish boiler. Neither is it necessary to confine the combustion to the slow rate of 4 lbs. per square foot of grate per hour, as was the general Cornish practice. Very good results, and perhaps as good as any attainable in ordinary practice, where thin and light fires are apt to suffer from neglect, can be got from a combustion of about 8 lbs. per hour.

It will be understood that the views above advanced do not apply to the peculiar forms of boilers made necessary by the impurity of the water used for supplying them. Where deposits of scale or sedimentary matter in considerable quantity exist, it might be unprofitable to use any but the most elementary form, with view to facility for cleansing, at some sacrifice of economy in evaporation. In by far the greater number of places where water works are to be erected, comparatively good water for boilers may be obtained if reasonable care is taken.

Judging of the claims of the new boilers that are constantly presented to the

agent and pressure, is the one of ascertaining the evaporative power of a boiler. The rate at which coal is burned largely qualifies the result, and the rapidity of the evaporation affects the amount of "priming" or water held mechanically in the steam, or "entrained," as it is called. Anhydrous steam, by which is meant steam with only its theoretical proportion of water, is rarely, if ever, produced. A percentage of water in excess of this quantity is probably always present. How much or how little this may be depends upon the proportion of the boiler to its work, the area of its steam delivering spaces, the amount of steam room and good or bad form generally.

Intermediate between the condition of foaming, which will empty a boiler of all its water with dangerous rapidity, and that of wet steam, so called, almost every concentrated and active boiler will be found, and on such it is very difficult to make a correct trial of evaporation. Causes like these probably account for the extraordinary claims daily made of evaporative results as high as 12 and even 14 lbs. It may be noticed as a suspicious circumstance in almost all such cases, that the rate increases with the activity and irregularity of the water circulation within the boiler.

It may, therefore, be said that practice

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corroborates the declaration that if due regard be paid to the apportionment of fire and grate surface, and to the setting and management of boilers, the difference in results between the several approved forms in use will not be very great in this special department, where considerations of weight and room are neither controlling nor specially important, and that no good can result from the employment of more active and concentrated forms, which are liable to rapid alterations in pressure, require greater care in management and are more subject to derangement.

The accompanying engravings, drawn to a scale of one-fourth of an inch to the foot, show in a very complete manner the details of a return tubular boiler of the pattern which we have mentioned. The boiler is, in this case, one of a set, but all the fittings and connections are so made as to enable each boiler to be used independently; hence the only difference in the setting necessary for a single boiler would be to build the furnace and outside walls alike on both sides.

Fig. 1 shows a front elevation of the boiler, with all the usual appliances. Two doors open into the furnace, each about 18 inches wide by 12 inches high. Fig. 2 is a longitudinal section through the brickwork, showing the general arrangement of the setting. At the front end there are no features particularly noticeable beyond the connections, which are very carefully designed. Instead of a combustion chamber back of the bridge wall, an apron is carried along to the back connection in such a way as to form a thin flue, less than 6 inches deep, from the furnace back to within 18 inches of the back end of the boiler, a distance of 8 feet. The furnace is 4 feet long. The boiler is 54 inches in diameter by 14 feet long and has 65 3-inch tubes. Through these tubes the gases from the back connection are returned to the front of the boiler. By this arrangement it will be seen that it is intended to obtain very perfect combustion in the furnace. This is comparatively easy, as the amount of coal burned per square foot of grate surface per hour is quite low. From the front end the gases return over the top of the boiler, which is covered by an arch. This top flue, shown in section in Fig. 4, is about 15 inches deep. A damper at the back end of the top flue controls the draft. This damper is worked by a handle seen hanging at the right of Fig. 1. Bevel wheels, shown in Fig. 3, carry the motion of the long shaft to the rod on which the damper is hung. This arrangement is also shown in the plan, Fig. 5. Both side and back walls of the setting are built with spaces in them. A cross section just in front of the steam dome is shown in Fig. 4. The arrangement of tubes is such as to leave a considerable body of water near or on the bottom plates of the boiler. The lugs by which the boiler is held are not arranged opposite each other (see Fig. 5), but are staggered. Tie rods, also shown in the same figure, hold the top of the walls together and take the thrust of the arch over the top flue. The furnace, of which a plan is given in Fig. 4, presents no features which need especial remark. The width might, at first sight, seem excessive but for the fact of the double fire doors.

The Melbourne Exhibition.

In Melbourne, one of the largest cities of Australia and capital of Victoria, which may be regarded in many respects as the principal colony of the country, an international exhibition is to be held next October. All the great nations have decided that their manufactures and produce should be well represented thereat, and have already secured ample room for their exhibition. The United States government has, through its agent, Mr. Thomas B. Pickering, applied for 30,000 square feet of space for the accommodation of American manufacturers. This space will in all probability be granted, but should any unforeseen difficulties arise the State Department will be requested to erect an annex, as it has done before in many instances, so that ample room will be secured for the most advantageous exhibition of American specialties and produce. Leading men in different departments of manufacture have so eagerly taken up the idea that 17,500 square feet have been already secured, and by every mail letter are received by Mr. Pickering either requesting information or applying for space. Shipping houses, both in New York and Boston, have offered reduced rates for the freight of goods destined for show, some of them even soliciting the transportation of freight at somewhat less than half their usual rates. The exhibition will continue from October 1, 1880, to March 31, 1881. All exhibits of whatever description will be admitted free of duty, and a special inducement is offered to the owners of works of art by a regulation prohibiting the copying, photographing or reproduction in any way of any article without the special permission of the exhibitor. Machinery is protected in a similar way, and inventors of new articles need be under no apprehensions, as protection is amply provided by the patent laws of the colony. Arrangements have been made to provide steam power so that all machinery may be seen at work. This steam power will be supplied gratuitously to all persons making application for it. England has, as might be expected, made arrangements for a very large space. America and Germany follow next on the list. Then come France, Austria and Italy.

A large number of American business men have formed an opinion that the Australian colonies are so clannish and attached to the mother country, that nothing will be purchased unless of British manufacture. This is very erroneous. At the Paris Exhibition, in 1878, the Australian farmer was well represented, and a large number of machines used in agriculture, and especially those with labor-saving appliances, found a ready sale. In fact, in Australia there is a splendid field for American speculation, and it is a matter of surprise to many merchants that measures have not been taken to develop trade with that country. It may be interesting to give a few statistics which indicate the vast and growing importance of the trade of Australia. By the latest available returns it is shown that, in the year 1876 the commerce of Australia

amounted to a total of \$462,950,000. In Victoria the imports amounted to \$78,520,000, and the exports, \$70,970,000. In the same year Australia took British manufactures and products to the value of \$92,072,500, the United States during the same year having sent only \$7,000,000 worth. It may be mentioned that the New Zealand railways, which are under colonial government control, have all their furnishing of the latest American invention, and 300-horse-power boilers and engines have recently been exported there from this city.

When the above statistics are considered, it will be seen that Australia is a most desirable market, and there is no reason why the manufacturers and producers of the United States should not avail themselves of this opportunity to extend their trade there.

In Australia there is always a demand for woodworking machinery, especially for the use of carpenters and builders, for stone-cutting and dressing machines, agricultural implements, appliances for sheep-shearing, every description of machinery used in the dressing of wool and the manufacture of woolen goods—which is a staple trade in Australia—all kinds of mining machinery, railway appliances, including steel rails and rolling stock, iron bridges, &c.; general and special tools and machines adapted for the construction and repair of machinery; complete systems of narrow-gauge railway; permanent and portable forges; plain, strong and economical steam engines, portable and stationary, with boilers, manufactured with a view to easy transportation; machinery for the production of tin and sheet-metal goods by the stamping or "drawing" process, American specialties in household hardware, silver-plated ware, saws and edge-tools.

Although the above list by no means includes one-third of the articles which it would be advisable to send for exhibition, it may suffice to give a general idea of the requirements of the Australian colonies, and may serve as a guide to intending shippers of goods for exhibition. In machinery Great Britain will undoubtedly be America's greatest rival, in hardware Germany will be the chief competitor, while France threatens to run America closely with a splendid show of silver and silver-plated ware, but, judging from the easy victory achieved by Tiffany at the Paris Exhibition, America will, in all probability, have a good chance of winning the prize.

American exhibitors should mark the trade prices of the articles exhibited, in order to facilitate the judgment of the jury, as well as for the information of visitors and intending purchasers. Considerable complaints have arisen on this subject at all the great shows of recent years, and it was insisted upon by the jury at the Paris Exhibition that all exhibits should have their prices marked on them in legible figures. The Sydney Exhibition, which has not been anything like signal success, was held too soon after the Paris one, but this cannot apply to that of Melbourne, as the principal exhibits from Sydney will be transferred to the former city, in addition to those now preparing for it. Applications for space will be received by Mr. Pickering until the 10th of March, and goods may be shipped, if by sailing vessels from New York or Boston, as late as May; but if shipped by way of San Francisco, may leave that port as late as the 7th of July. Mr. T. R. Pickering, who has been connected with exhibitions for many years, and whose name is known in connection with those held at Paris in 1867, at Vienna in 1873, at Philadelphia in 1876 and at Paris in 1878, says that the Melbourne Exhibition will be grand success, and strongly urges American merchants and manufacturers to send fair samples of their ordinary production, and he predicts a rapid development of American trade in the Australian colonies.

British Colliery Explosions.

So many tons of coal so many lives. Roughly speaking, for every hundred thousand tons of coal raised in Great Britain one human life is paid. From 1861 to 1875, inclusive, 15,905 lives were lost in raising 1,605,576,193 tons of coal, or about 1000 lives a year. In 1864 the life tax was 857, or one to 110,000 tons; in 1866—the year when on two successive days in December, in the Oaks and Talk-o'-the-Hill collieries, 425 men were killed—it was 1484, or one to 68,000 tons. In 1877 the loss was 1208; in 1878 it rose to 1413, the highest in 30 years save the memorable year already mentioned. Since the inspection of mines was undertaken by the government the ratio of deaths to persons employed has been steadily decreasing. In 1851 one man of every 219 was killed; in 1876 one of 551. Exceptionally bad as 1878 was, the ratio was one to 336. The continental rate of loss is higher; in Prussia in 1873 one of every 355 persons employed was killed, as against one of 479 in England; in 1877 the figures were 377 to 409. The English statistics for 22 years were as follows:

1876-60	20,018 lives lost of 2,465,722
1861-70	13,421 lives lost of 3,194,45
1877-78	9,058 lives lost of 3,600,000

The showing is satisfactory enough, though the millennial period anticipated by Robert Stephenson has not yet been reached. There was hardly a colliery in England, he said, that might not be worked with perfect safety from explosions, the great means for insuring safety being to quadruple the shaft area. The most fertile sources of calamity are explosions of fire-damps and giving way of roofs. Of 1413 men killed in 1878 there were 580 burned or suffocated and 351 crushed, shaft, surface and miscellaneous underground accidents accounting for the remaining victims. If the inspectors and proprietors were only loyally supported by the men the loss of life from explosions would be nil; but though the man who takes matches into the pit, or uncovers his lamp to light his pipe, plays the stake of his own life as well as the lives of the mates to rescue whom from peril he will at all times venture heroically, there is apparently no possible way of stamping out this carelessness, though both inspectors and magistrates do their duty energetically, as readers of English papers can testify.

The list of notable colliery explosions in Britain since the accession of Queen Victoria is a most formidable one, as any person will

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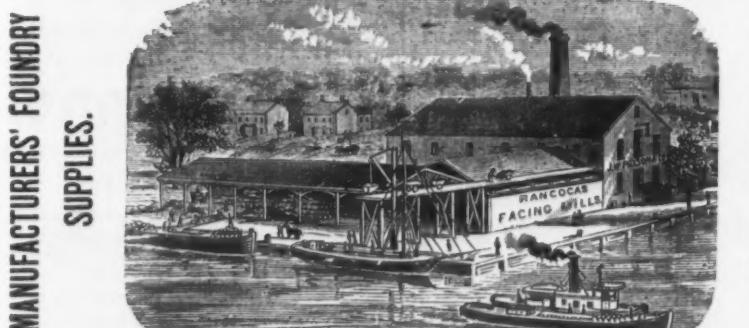
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September 28, 1844, of 100 men employed at Haswell,

near Durham, only five, who were sheltered behind a train of wagons, escaped alive.

August 21, 1845, occurred the sixth explosion known at Jarro, near South Shields, since 1817; 38 men were killed, besides one rescuer, Defty, who had pressed onward into the fatal damp too gallantly.

There followed the explosion of the Oaks Colliery, near Barnsley, March 5, 1847—70

lives; Darley Main, near the same place, January 4, 1849—75 lives; Letty Shenkin,

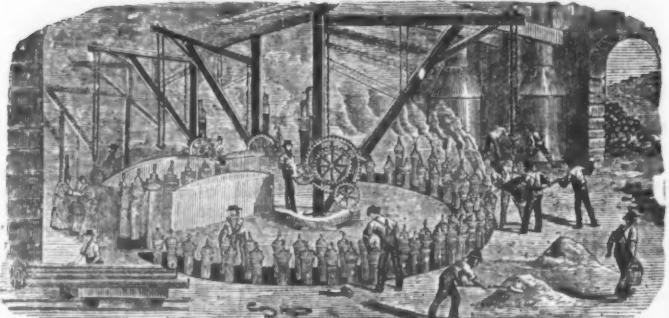
Aberdare, June 17, 1849—52 lives; Nitshill,

near Paisley, March 15, 1851—62 lives.

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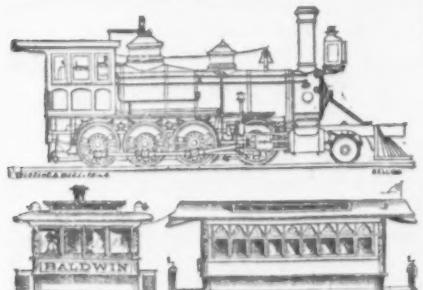
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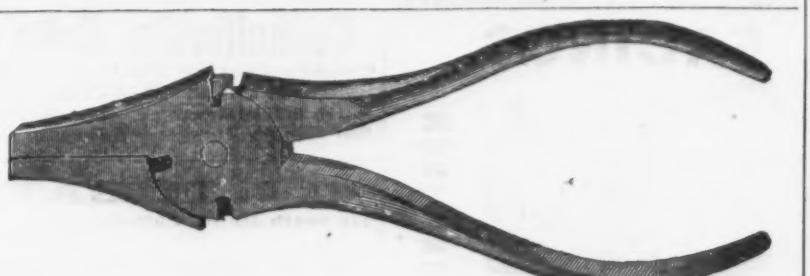
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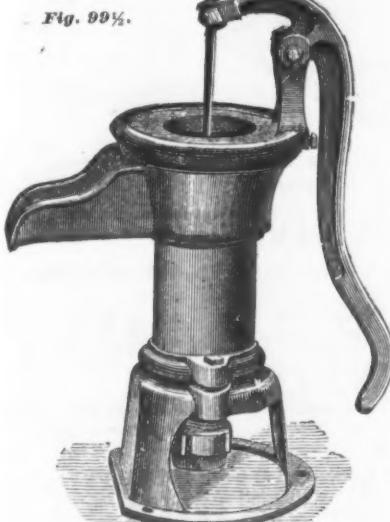
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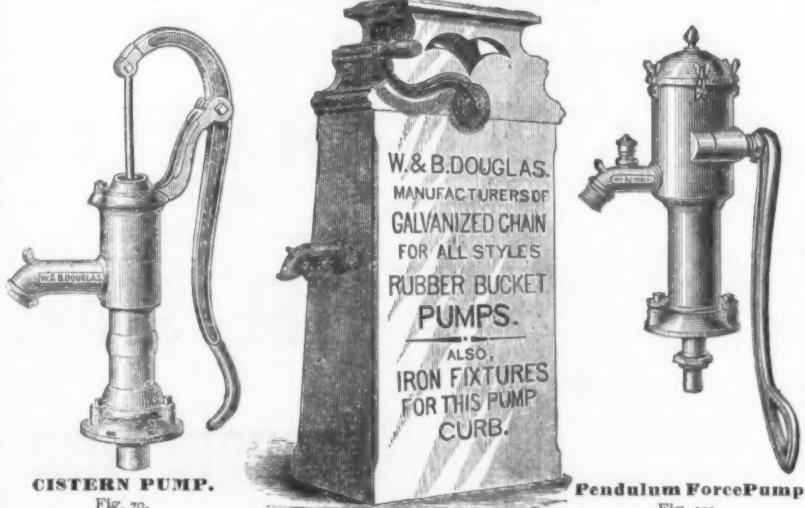
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The Chemical Composition of Pig Iron
as Affecting its Value for Foundry
Purposes.

So numerous are the circumstances which affect the value of pig iron for foundry purposes, that it would seem almost a hopeless task to endeavor to draw inferences from its chemical composition upon its properties. One grade of pig rarely combines all the elements which will insure the production of castings fit in every respect for the purpose desired, and it is generally necessary to resort to mixtures of various classes, so chosen that the defects of one counterbalance and correct those of the other, while at the same time the practical founder is limited in his choice by the prices and the variety of the material which his local market offers to him. The question how to produce, at the lowest price, the best castings with the metal within easy reach is, therefore, a delicate one; and it is by no means astonishing that founders, relying upon their experience alone, have strong preferences for certain grades of metal, and are willing to obtain mixtures in which they have confidence, even at a sacrifice, because they are frequently ignorant of the reason of the superiority of their pet brands. They are frequently excessively conservative, and find it difficult to adapt themselves to altered circumstances. While in the end actual tests alone can serve to decide upon the merits of an unknown brand, there can be no doubt that a knowledge of the chemical composition of the pig may serve as a guide in more rapidly and cheaply arriving at a final conclusion. In order to correctly appreciate the effect of certain chemical impurities or constituents, it is necessary to possess at least a general idea of their effect. The result, of course, can only be an approximation, because no exact formula can be devised, the presence of one substance in the pig either intensifying or counterbalancing the effect of others. As the precise effect of even a single impurity, if alone, cannot be numerically expressed, it is obviously impossible to predict closely what will be the result of one of the innumerable combinations between four or five chemical impurities. Yet, as we have already stated, every chemical constituent of the pig has a well-defined effect upon all or a few of the properties desirable in the finished product. A work recently published by Prof. Ledebur, of Freiberg, Germany, admirably summarizes the main points in question, and from it we take the following data:

Pig iron always contains carbon, the lowest amount being 2.3 per cent., and if it has little manganese, not over one-half of one per cent., the amount rarely exceeds 4 per cent., while 5 per cent. may be considered a maximum for pig iron low in manganese. The capacity of pig for absorbing carbon increases with the percentage of manganese, and, therefore, 5 per cent. is common when there is 15 to 20 per cent. of manganese, while with ferromanganese, an alloy running as high as 85 per cent. of manganese, it rises to 6.5 or even 7 per cent. of carbon. It is an important fact that as the carbon increases the point of fusion of the iron goes lower. Liquid cast iron has all the carbon in solution, but when the metal chills, a portion of it is separated as graphitic carbon, which causes the fracture of the metal to look gray, and is the characteristic constituent of gray pig. The size and the amount of graphitic carbon in cast iron depends primarily upon the rate of cooling of the metal, the maximum being reached when it is done very slowly. This gives the founder an opportunity to control the quantity of graphitic carbon in the castings, and the fact mentioned above explains why the graphite is greater in those portions of castings which are large and cool slowly than other thinner parts which chill rapidly. It is not necessary, however, to remelt cast iron and allow it to chill under conditions different from those under which they first cooled in order to change the amount of graphitic carbon. Continued heating at a bright-red temperature, and gradual cooling by packing in some poor conductor of heat, will suffice to turn castings which have become white by too rapid chilling, into gray cast iron. This tempering process, which has nothing in common with the process of making malleable iron, is resorted to occasionally in works which are forced to use metal tending to produce white castings. The effect of the presence of graphitic carbon is to loosen the grain of the iron and reduce its density and tenacity on the one hand, while on the other it renders the work of cutting the metal with turning and shaping tools much easier, and at the same time reduces its brittleness. This constitutes its main advantage over white pig, and while graphitic carbon is characteristic of gray pig, combined carbon, the second form, preponderates in white pig, although it should be noted that it is always present also in gray pig. The tenacity and elasticity of iron seems to increase to a certain limit in direct proportion to the combined carbon it contains, but beyond that limit the tenacity and, notably, the elasticity decline very rapidly. The determination of the exact point when the maximum of both desirable qualities is reached is an uncertain matter, because a decrease of the combined carbon entails an increase of the graphite, which, as we have already stated, injuriously affects the tenacity.

The presence of manganese affects both the hardness and the fusibility of pig iron, both being increased as the amount grows. Manganese has a greater affinity for the metalloids than iron, and it is for that reason that manganeseiferous pig is capable of absorbing a greater amount of carbon. Closely related to this peculiarity is the fact that it has a tendency to retain carbon in a combined soluble state, so that the presence of manganese obstructs the separation of graphitic carbon and thus tends to prevent the formation of gray pig. While thus manganese is objectionable in some respects, it is valuable in others. It has a great affinity also for sulphur and phosphorus, and if the pig be left quietly in a liquid state, its compounds or alloys with those bodies rise to the surface of the metal, purifying it to a certain extent. It is very effectual also in preventing oxidation of the iron, a circumstance which is some-

times taken advantage of in remelting pig. Pig iron almost always contains silicon, the amount varying generally between 0.1 and 4 per cent., but exceptionally rising to 10 per cent. It has the effect of interfering with the capacity of the pig iron to absorb carbon, but is absolutely essential for the production of gray pig. Iron free from silicon remains white even if it is slowly cooled, and gray pig may be converted into white metal by withdrawing it from its silicon. As we have already noted, manganese has a certain effect, and, therefore, gray may remain white, even if it contained a sufficient amount of silicon to cause a strong separation of graphite, if its action be counterbalanced by the presence of manganese. Again, pig holding several per cent. of manganese may turn out gray if a sufficient amount of silicon is present simultaneously. Only 0.4 per cent. of silicon, or even less if phosphorus and sulphur are absent, will make pig iron gray, provided the amount of manganese it contains is low. Those brands are generally highest as regards the amount of graphite found, which contain 2 to 3 per cent. of silicon and about 4 per cent. of total carbon. As soon as the percentage of manganese goes beyond one per cent., the total carbon, it is true, will increase; but, on the other hand, much more silicon will be necessary in order to induce a separation of graphitic carbon. This relation of manganese and silicon to carbon explains why melted white pig will change to gray if it be given an opportunity to absorb silicon, or to lose more manganese than is necessary to counteract the silicon present. Silicon affects the physical properties of pig in a manner quite similar to carbon, although the action is much weaker, so that one part of carbon may be considered equivalent to about two to five parts of silicon. It should be noted, however, that the presence of graphitic carbon caused by the silicon may modify or even counterbalance its effect. This explains why silicon gray pig is not so hard as, and much more easily worked than, it would be if the silicon were not present, and that, for the same reason, it is less brittle than white pig free from silicon. At the temperature of melting iron, silicon possesses a strong affinity for oxygen, so that the greater portion may be removed by an oxidizing action, and the pig be thus converted into white metal. Under certain circumstances, notably by the presence of manganese and materials rich in silicon, additional amounts of silicon may be introduced into the iron.

Phosphorus is a frequent impurity in pig iron, the amount varying from a trace to as much as 3 per cent. Its effect is to sensibly reduce the hardness, and notably to affect the elasticity and toughness of the castings. Phosphoric pig is not capable of resisting shocks or concussions without breaking, and this disadvantageous effect is increased as the amount of combined carbon grows. For most purposes a percentage lower than 0.5 per cent. is not likely to make castings liable to sudden fracture, but it is more plainly noticeable at 1 per cent., and becomes dangerous at 1.5 per cent. The brittleness of phosphoric castings is affected by the amount of combined carbon, and as the latter increases as the percentage of silicon decreases, an average amount of the latter will act favorably upon the use of such metal for castings. Pig holding more than 1.5 per cent. of phosphorus should under no consideration be used, unless it is mixed with better grades. The fluidity of molten pig is greater when phosphorus is present, and such metal sharply fills the molds and chills with a smooth surface, and it is for this reason that a moderate percentage, not over 1 per cent., is considered quite acceptable. It must be kept lower, either when it is desired to produce castings which are expected to be able to resist shock well, or when the articles produced are thin. In the latter case rapid cooling increases the percentage of combined carbon, which, as we have noted, exaggerates the action of phosphorus. It is, therefore, extremely erroneous to believe, as many text books teach, that phosphoric pig is the best material for art castings. Phosphorus impairs the formation of graphitic carbon, and therefore acts in this respect like manganese, although not in so pronounced a manner. If two brands of pig possess the same percentage of carbon, then the one being highest in phosphorus must also contain the greater amount of silicon, if the castings produced from both are to be equal as regards the amount of graphitic carbon.

The quantity of sulphur carried into pig iron during the process of smelting ores in the blast furnace, naturally depends primarily upon the amount which the ores themselves contain, but it is greatly influenced, also, by the nature of the blast furnace cinder, the amount being greater if the cinder is high in silica. The presence of sulphur has the effect of impairing the tendency of the carbon to separate in the graphitic form, and of decreasing the dissolving capacity of the iron. As regards the latter its action is opposed to that of manganese, while concerning the former it would counterbalance the desirable effect of any silicon present. It is much stronger in this respect, pig containing 1 per cent. of phosphorus remaining white even if considerable quantities of silicon are in the metal. A small percentage of sulphur is advantageous rather than otherwise, as regards the strength and the elasticity of the castings, provided the increase in the amount of combined carbon caused by its presence does not impair this result. It is for this reason that for castings which are to be made very strong, pig is used with much success that runs as high as 0.1 per cent. But, as a rule, sulphur is not desirable beyond 0.06 per cent., because in even as small a quantity as 0.1 per cent. it is injurious in other respects. It is a serious inconvenience which sulphur produces, that the pig will remain thick even at high temperatures, and that it does not well fill the molds.

Such is the effect of the various chemical impurities upon the quality of pig iron for castings. It will be noted how largely various bodies differ, and how the simultaneous presence of one or more in appreciable quantities is apt to counterbalance the good effect or correct the defects occasioned by others. We may state, in conclusion, that arsenic, if present in quantities of about

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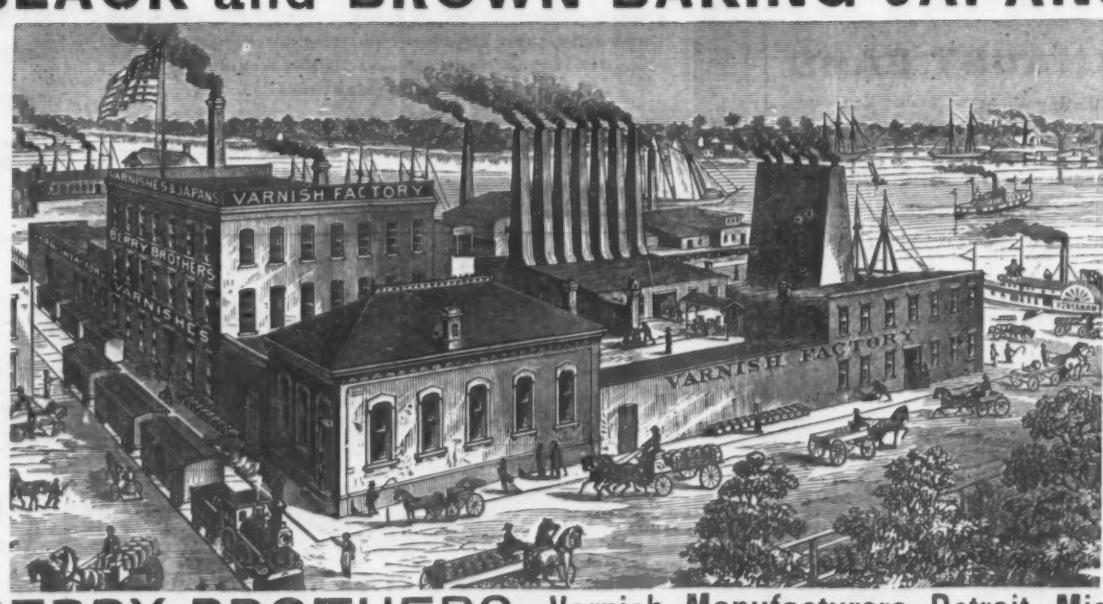
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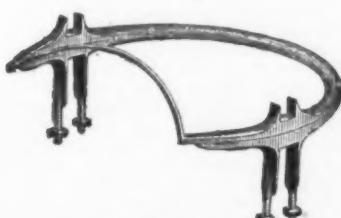
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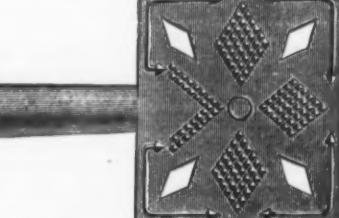


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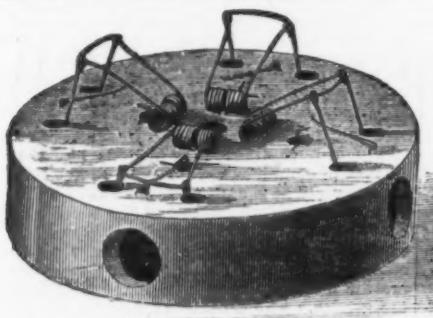
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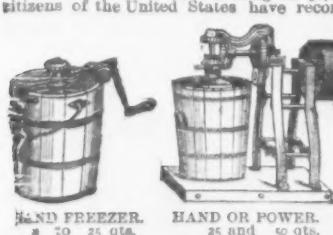
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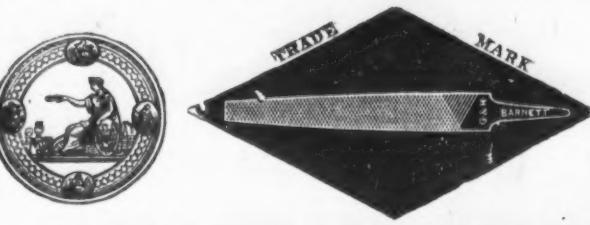
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Our KNIVES are guaranteed to STRIP
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All goods are put up ONE DOZEN IN A BOX.
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Our SPOONS, FORKS, etc., are guaranteed to STRIP
On Tea Spoons, 48 dwt. per gross.
On Dessert Spoons and Forks, 72 dwt. per gross.
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ALL OTHER GOODS IN PROPORTION.
All our SPOONS, FORKS, etc., are plated upon
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The best base known for plating upon.

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Our Hollow Ware is plated upon the
FINE WHITE METAL, and is guaranteed
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This knife is the best in use for cutting down hay and straw in mow and stack, cutting fine feed from bale, cutting corn stalks for feed, cutting peat and ditching marshes.

The blade is best cast steel, spring temper, easily sharpened, and is giving universal satisfaction. A few moments' trial will show its merits and parties once using it are unwilling to do without it. Its sales are fast increasing for exports as well as home trade, and it seems destined to take the place of all other Hay Knives.

They are nicely packed in boxes, one dozen each, of 50 pounds weight, suitable for shipping by land or water to any part of the world.

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The rapid increase in the use of Nickel-Plating owing to the introduction of the Weston Machine and the very low price of nickel material, enables us to give greatly reduced estimates for complete outfits.

We are furnishing outfits specially adapted for Stove work, giving a pure white deposit on plain or matt surfaces.

Outfit complete, with Dynamo-Electric Machine Tanks, Anodes, solution, &c., &c., \$250.

We beg to refer to the following Stove Manufacturers among 500 other houses using the Weston Machine: Richardson & Boynton, S. S. Jewett & Co., Fuller, Warren & Co., Perry & Co., Detroit Stove & Ornamental Michigan Stove Co., Co-operative Stove Co., E. & C. Gurney, Hamilton & Toronto, and many others.

INFRINGEMENTS.

We call attention to infringements of the Weston Machine, in which we have a patent, and are granted protection by the government. The Weston Co. are owners by grant or purchase of all forms of Automatic Switches for Plating Machines. The adoption of these machines will certainly lead to great loss to parties purchasing or using them.

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SASH CHAINS,

With Patent Attachments.

Warranted for ten years. Chains of any size made to order, and trade supplied with liberal discount.

in the face. It is safe to say that the last five years have developed a disposition in the West to pay up their obligations and have no more of them."

"Then the general outlook for the West is cheerful!"

"In my opinion the entire Northwest will witness in the next five or ten years the greatest development it has ever known. The bountiful harvests for the past two years, the continued yield of precious metal in Colorado, coupled with the fact that at Leadville alone the output leaped from \$3,152,925 in 1878 to over \$11,000,000 in 1879, the unexpected facts in relation to the yield of wheat in the Red River country, and the pushing to completion of a hundred railroad projects, must have the effect of turning thousands Westward. Never were the times more propitious in Kansas, Nebraska, Minnesota and Iowa than now. Then there is Montana. Abundant snows that are now falling assure a fruitful season and an abundance of water for mining. The stock interests are growing, and they are to have several railroads in 1880, which will increase the population and wealth. I predict that the increase of emigration during 1880 will be greatly in excess of 54,000—the increase of 1879 over the previous year."

motives on the Pennsylvania road has made it necessary to place three more engines on each track in the erecting shops at Altoona, so that repairs can be made on 18 engines at one time instead of 14, as heretofore. An extra force of men has been employed by the company for the purpose of breaking up condemned locomotives.

The cause of the stoppage of the Warwick Furnace was the wearing out of the bosh and lining, which have to be replaced entirely. The furnace has been in blast two years and three weeks, and in that time has made 37,400 tons of iron. During 1879 the yield was 19,387½ tons.

The Phoenix Iron Company's furnace No. 2 has just been blown in after being idle five years.

The Central Foundry and Machine Shop, Reading, is full of work at present. Machinery is being made for a number of hat factories. A large planer has just been placed in the machine shop and other improvements have been added. The machine shop has been running about 15 hours a day during the past month.

At the Co-operative Foundry, Beaver Falls, an extra force of hands are employed, and orders are coming in fast. Among those lately received is one for four car loads of stoves, which has since been doubled, the parties ordering also agreeing to pay any advance in iron that may be made.

The Whitten mill, Conshohocken, Pa., was sold at public sale to Alan Wood & Co., for \$22,500. It is the only mill at present idle in Conshohocken, and will be leased to a manufacturer as soon as possible.

Work was resumed at the Schuylkill steam forge at Douglassville last night, after having been idle since the 21st of December for general repairs. A large number of orders will be received, and three turns of hands will be employed, and thus the forge will be in operation day and night.

The A. T. Wolf Stove Works, of Beaver Falls, are behind their orders, and are building an addition to their present works.

PITTSBURGH AND VICINITY.

Some of the mills are stopped for want of coal.

The Lucy Furnaces are now receiving a large cargo of Spanish ore.

The Crescent Steel Works are building a large two-story brick addition to their warehouse. The extension is 60 feet long and 34 feet wide.

The Curdy Tank Works are receiving 400 tons of tank iron, which is manufactured at Graff & Bennett's mill, at Millvale. Five 80-ton tanks have been ordered for Philadelphia, one for Long Island and three for New Jersey.

The Morgantown New Dominion says it is reported there that the gentlemen who have been prospecting in the vicinity of Laurel Iron Works have made extensive purchases there, and will begin operations at Privedale next spring. The story is supplemented by a report that the purchasers invested on the promise of the railroad company that the Southwest road should be built to that place next summer.

H. C. Frick & Co. are building about 80 new ovens between Morgan's works and Broadford.

Chess, Smyth & Co. have raised the wages of the tackers 20 per cent.

Ohio.

Scioto Furnace is cutting 14,000 cords. She has not been out of blast during the last five years longer than necessary to put in a new hearth. She has 6000 tons of ore on hand. During the calendar year 1879 she made 3500 tons of iron on an average of 160 bushels of charcoal.

Hamden Furnace will make a 3000-ton blast this year. The experiments to dephosphorize its 9 foot ore vein have not as yet proved a practical success.

Wellston Furnace has been thoroughly re-made (13½-foot bosh), and will start within a month.

Brown, Bonnell & Co.'s new rolling mill, at Youngstown, just completed, was put in operation Monday last for a trial test of the machinery. The mill is constructed in the shape of an L; is 173 feet long, 80 feet wide at the base of the L, and 70 at the ends. It is 53 feet to the top of the ventilator, sheet iron roof, well constructed, with iron braces inside. The machinery consists of a Buckeye engine, cylinder 28 x 60 inches, built by McIntosh, Hemphill & Co., Pittsburgh, which runs a train of three-high 7-inch muck rolls, with coffee-mill squeezers, a 20-inch bar mill, three-high roughing rolls and two-high finishing rolls.

This mill is intended to make a specialty of manufacturing fish plate. At the north end of the mill, close to the straightening bench, there is a punch which is to punch the holes and cut the plate to the desired size with one motion. There are 14 puddling furnaces and three heating furnaces in this mill, with steel boilers attached, manufactured by W. B. Pollock & Co. These furnaces have a large fan and model blast connections. This mill is understood will give employment to 150 additional men. The puddling department began operations Tuesday morning, and it is expected that the bar mill will go on about Thursday morning.

Illinois.

A Joliet telegram says orders have been received from the Joliet Steel Company to make immediate preparations for operating the blast furnaces and merchant steel mill (formerly the iron rail mill) of the company in Joliet. They have lain idle since 1873. The south furnace will be started first. Its capacity is about 70 tons of Bessemer pig iron per day, valued at about \$4000. The other furnace will be got ready at once. Workmen are now putting in the fire bricks and preparing the hot-air retorts. Lake Superior ore will be principally used.

Kentucky.

Iron Hill's furnace blew in on the 27th ult.

It is apprehended by persons well informed in labor movements, that the present year in the coal region will not be as free from strikes as the past three years have been.

A significant step was taken recently at Forestville, in the western part of Schuykill County, in the revival of the old Workingmen's Benevolent Association, which was crushed out by Mr. Gowen in 1875. The new lodge already numbers nearly 100 members, and it is reported that others are organizing in different parts of the region.

H. D. SMITH & CO.,

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Manufacturers of the

BEST QUALITY CARRIAGE MAKERS' HARDWARE.

Manufacture the Largest Variety of Forged Carriage Irons of Best Material and Workmanship.

PRICES LOW FOR QUALITY OF WORK FURNISHED.

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Polished or Blued Horse Nails, Hammered and Finished.

The Saranac Nails are hammered hot and the finishing and pointing are done cold. Quality is fully guaranteed. For sale by all leading iron and hardware houses.

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Rim and Central Fire, all Sizes.

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GUN WADS, Black and Pink Edge,

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PAPER and BRASS SHOT SHELLS.

PAPER.

Celebrated "U. M. C." Sizes, 8, 10, 12, 14, 16, 20, Central Fire.

BRASS.

Berdan, Solid Anvil. Sturtevant, Movable Anvil. Buffington, Movable Anvil
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Kenney's Patent Indentation to prevent Wads from starting.

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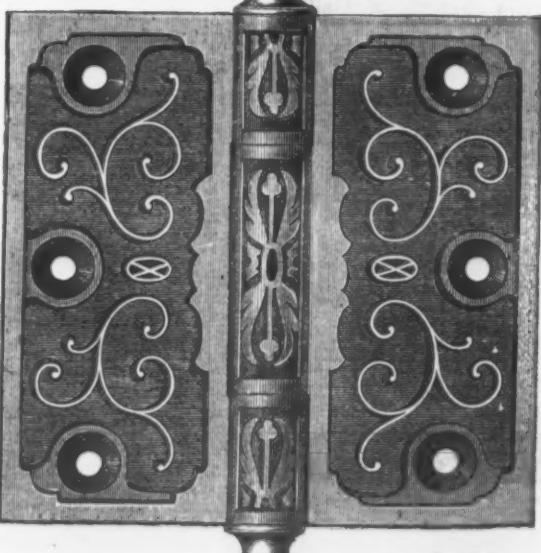
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Bar and screw of cast steel, with two extra cutter heads. Manufactured and for sale by the
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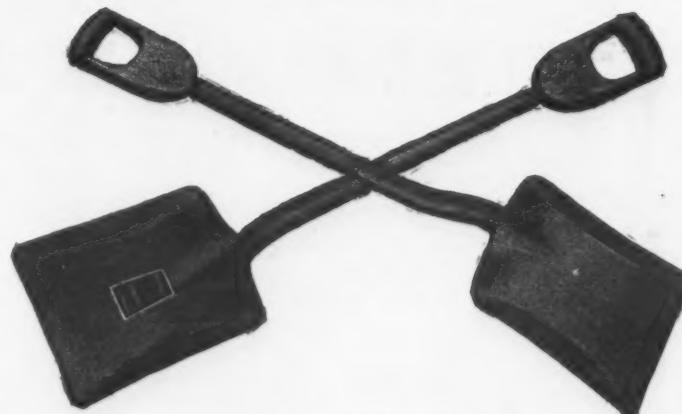


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RATTLER,
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Solid Vulcanite EMERY WHEELS

LARGE WHEELS MADE ON CAST-IRON CENTER IF DESIRED.

The properties of these Wheels are such that they can be used with great advantage and economy for cutting, grinding, and finishing Wrought and Cast Iron, Chilled Iron, Hardened Steel, Slate, Marble, Glass, etc. These Wheels are extensively used by manufacturers of Hardware, Cutlery, Edge Tools, Plows, Safes, Stoves, Fire Arms, Wagon Springs, Axles, Skates, Agricultural Implements, and small Machinery of almost every description.

PATENT ELASTIC
Rubber Back Square Packing
BEST IN THE WORLD.

For Packing the Piston Rods & Valve Seats of Steam Engines & Pumps.

It represents that part of the packing which, when in use, is in contact with the Piston rod. A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam tight, and yet creates little friction.

This Packing is made in lengths of about 30 feet, and of all sizes from $\frac{1}{2}$ to 2 inches square.

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Pat. 11,308, 213,807.

For Halls, Flooring, Stone and Iron Stairways, &c.

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This practical and indispensable article—especially for wear where exposed to ice, snow, or slush—was first introduced by this company several years ago, and is now used in building almost indestructible, when proper materials are used in its manufacture, whilst the cheap, inferior quality forced on the public by reckless imitators of our patent goods soon becomes brittle and crumbles to pieces. Address

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8 oz. 1 lb. $\frac{1}{2}$ lb. $\frac{3}{4}$ lb. 2 lb. 4 lb. 6 lb. 7 lb. 8 lb.

CURVE HEAD. FLAT HEAD. COLE HEAD. ROUND HEAD. COUNTERSUNK OVAL HEAD. MACHINE HEAD. TIRE HEAD. GROOVE HEAD.

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The imports and exports of France for 1879 have just been published. They are briefly as follows: Imports—Food, 1,823,600,000 francs; raw materials, 2,126,601,000 francs; manufactures, 420,918,000 francs; miscellaneous, 223,700,000 francs; total, 4,594,837,000 francs. Exports—Manufactures, 1,735,491,000 francs; raw materials and food, 1,254,193,000 francs; miscellaneous, 173,406,000 francs; total, 3,163,000,000 francs. Compared with the return of the previous year, it shows an increase under imports of 418,000,000 francs, and a diminution under exports of 16,000,000 francs. The chief source of increase under imports is, of course, the item of food, which shows an advance on 1878 of 368,000,000 francs. There has also been a small advance in the importation of raw materials amounting to 41,000,000 francs. The slight diminution of the exports of last year on those of 1878 is confined to manufactured articles.

A suit of much interest and importance to the mercantile community has just been decided in New Orleans. It appears that the standing of an irresponsible commercial firm was rated very high by the mercantile agency of R. G. Dun & Co. Schmidt & Seigler, of New Orleans, asked for a special report on the firm in question, which was given, but the defendants failed to inform

the plaintiffs that the information communicated had been obtained from the members of the firm in question. Relying on the favorable report made by the agency, Schmidt & Seigler sold the firm a bill of goods, and when they found themselves unable to collect the amount due, brought suit against the agency. The verdict gave them \$1000. The case is important for the reason that, if the verdict is sustained by the higher courts, it will establish the responsibility of mercantile agencies for losses resulting to their clients by reason of erroneous reports and failure to use due diligence.

The German Tariff and the Iron Trade.

In no civilized country have commerce and manufactures been put to so severe a test by wide and sudden fluctuations in tariffs as in Germany. The question of free trade or protection has been treated by those in power as one in which the only interests deciding the course to be taken were those of political expediency. The unparalleled advance of the political power of the nation—due to an admirable, though severe, military system, and shrewd diplomatic management—have introduced many elements into the discussion of the tariff policy of the government which tend to obscure it. From 1818 to 1865 Prussia adhered strictly to the principle of protecting and fostering home industry by import duties on foreign manufactured goods, but in 1865 Bismarck forsook the ancient traditions and initiated a system which approached free trade as closely as possible. The rapid succession of the two great wars of 1866 and 1870-71 naturally involved an exceptional state of affairs, and the destruction caused by them, together with the distribution of the gold paid by France, led to a period of inflation which affected all branches of industry, and appeared to be chiefly favorable to the iron trade, which was in receipt of enormous orders for the construction of new strategic lines of railway, war material, &c. Prices rose rapidly, and Germany, unprotected as it was, became a very profitable market for the manufacturers of adjoining states. The result was that imports of all classes of goods rose enormously. It is estimated that the value of finished products introduced from other countries, which could have been made in Germany if protected by a tariff, has amounted to a sum at least equal to that received a few years ago from France. Indirectly it has, therefore, been expended for improvements for which the materials were furnished by foreign manufacturers. When, therefore, the temporary demand subsided, German manufacturers were left to struggle against an enormous bulk of cheap goods for which foreign countries—notably England, which had lost very important markets (for instance, our own)—had no other outlet. A period of depression followed, which culminated in the adoption of a protective tariff. While all the provisions of the law passed on the 15th of July, 1879, did not go into effect until the 1st of January, 1880, some portions went into operation at once and others on the 1st of October, and the effect produced may, therefore, be traced to a certain extent even at this early date, and as the iron trade appears to have been one of the first industries to recover, some data will possess interest.

The Siegen district prices of pig have risen in a short time from 50 to 85 marks per metric ton, and in Silesia an advance has taken place from 45 to 70 marks, while coke and ore have in some cases appreciated at a greater rate. This improvement has been attributed by some to a demand on the part of the United States; but when it is remembered how largely this has been overrated in the case of England, it will be readily understood how insignificant the direct effect of some shipments of old iron and scrap from Germany has been upon the iron trade of that country.

It is evident that one of the main causes of the revival of the German iron trade has been the reintroduction of the duty on iron, low as it is. This is clearly reflected in the returns of imports and exports, some of which are published in the *Annalen für Gewerbe u. Bauwesen*. For the first three quarters of 1879 the imports of pig iron into Germany were respectively 104,917, 189,957 and 32,516 metric tons. It might be urged that this sudden decline is really due to the fact that German consumers and speculators bought foreign, notably Scotch and Cleveland pig, in anticipation of the passage of the tariff, and that therefore the stocks in Germany were ample enough to meet the demands of the trade. It would be idle to deny that to a certain extent this is true, but it cannot even in part account for the sudden falling off in the demand for some time after the passage of the tariff. We know from the returns of the British Board of Trade that this shrinkage of the trade with Germany has continued during the fourth quarter of the year, and it is only necessary to state that, compared with the 32,516 tons imported during the third quarter of 1879, the foreign supply for 1878 and 1877 was respectively 132,740 and 156,895 tons, or between five and six times as great. On the other hand, the exports of German pig have continued since the passage of the tariff with little abatement. During the second quarter of 1879 the exports of pig were 110,945 tons, against 97,917 tons during the third, which, however, was greater by 11,400 tons and 6850 tons compared with the corresponding periods in 1878

and 1877. A similar state of affairs is shown by the leading manufacturers of iron. The imports of scrap were only 1757 tons during the third quarter of 1879, against 10,877 tons during the second, and 8495 metric tons during the first quarter. The exports amounted to 7458 tons during the third quarter, against 5958 tons during the second of 1879, and 11,255 tons during the third of 1878. The figures for bar iron and various shapes, for plates, locomotives, machinery, &c., show that those articles too were affected in a similar manner. There can be no doubt, therefore, that at the present juncture the importations of iron and steel into the German Empire have been checked, and that the amounts formerly drawn from other countries are now manufactured in German works, thus increasing the business of establishments already at work, and giving employment to works which have been lying idle for some years. It is likely that the coming year will more emphatically exhibit this change, as the duty on pig went into effect only during the course of the second quarter of the last year, while that in manufactures of iron was in force during the third quarter only. Their effect is strongly marked by the contrast with the highest grades of goods made from iron and steel, the duty on which was not changed by the law of July 15, 1879. While, as we have seen, the imports of the bulk of iron manufactures have declined, these goods have remained stationary, and in some cases have advanced a little as regards the products left without an increased protection. The beneficial effect of the tariff is, therefore, clearly shown, even at this early date, and there is every prospect that the German iron trade will with its aid enter upon a period of prosperity of which it sorely stands in need.

Canadian Trade.

Whether the Dominion of Canada, which has suffered extreme depression in its industries and trade since 1873, will prosper under the tariff which so seriously interferes with her trade with the United States, is a question which cannot soon be determined. However, as it is a matter of much interest to a large class of our readers, we have been at some pains to gather statistics of Canadian population, wealth and trade which will aid in forming an intelligent opinion of the industrial and commercial future of the country.

AREA AND POPULATION OF THE DOMINION OF CANADA IN 1871 (LAST CENSUS)

Provinces.	Square Miles.	Population.
Ontario	107,780	1,620,851
Quebec	193,353	1,191,516
New Brunswick	2,379	281,594
Nova Scotia	911,211	204,962
Manitoba	13,979	12,728
Prince Edward's Island	7,133	94,023
British Columbia	356,000	33,586
North West Territory	2,500,000	60,500
Total	3,372,290	3,666,956

The nationalities represented in the Dominion population are made up as follows:

French	5,685,040	Scandinavian	1,623
Irish	646,000	Black	1,725
English	765,369	Indians	24,745
Scotch	549,946	Other nationalities	94,103
German	302,991	Totalities & races	130,222
Dutch	20,662		
Welsh	7,773		
Swiss	2,952		
Total	8,911,099,577		

The chief cities are:

Montreal	107,225	Hamilton	26,716
Quebec	59,699	Ottawa	21,545
Toronto	46,000	London	15,826
Halifax	39,582	Kingston	12,407
St. John's	38,803		

Immigration has developed as follows:

1871	27,777	1874	39,373
1872	36,578	1875	27,384
1873	50,050	1876	25,633

There passed through Canada, aside from the above bona fide settlers, in 1872, 52,608 persons; in 1873, 49,059, and in 1874, 40,649. There immigrated from the United States in 1873, 8971 individuals, and 14,110 in 1874.

It is safe to estimate the present population of the Dominion at 4,000,000. Trade has, meanwhile, fluctuated a good deal, with a steady excess of import over export.

CANADIAN IMPORT AND EXPORT, MERCHANDISE ONLY.

Fiscal year	Import	Export	Excess of Import over Export
1871	\$56,947,483	\$74,173,018	\$18,225,535
1872	107,709,117	83,639,663	24,070,454
1873	107,709,117	83,639,663	24,070,454
1874	127,404,594	87,744,292	40,659,302
1875</			

makers. It is not hoops that are imported, as a piece of hoop iron is not a hoop until it is riveted together. If it ceases to become hoop iron as soon as it is cut to length and has a hole punched in one end, what is it when a hole is punched in the other end and it is bent round and riveted? Justice to the manufacturers of the country, justice to their workmen and justice to the revenue demands that this evasion of the law shall no longer continue, but that the plain, evident meaning of the statute shall be followed, and these large importations of hoop iron be forced to pay the duty provided by law.

Bisulphide of Carbon Motors.

Every few years the subject of generating power from the vapor of bisulphide of carbon attracts the attention of a certain class of experimenters in mechanics, and, as the result, we have more or less frequent announcements that results have been attained and economies secured which must inevitably throw the steam engine out of use and effect "a mechanical revolution." Probably the science of steam engineering would not be "revolutionized" so often if it were not so easy to secure large sums of money from credulous capitalists, who are always ready to take hold of a Keeley motor or a Payne electro-motor on faith, but who would not buy a house without proving it or a diamond without the judgment of an expert as to its value and size. Because these wonderful inventions do not effect the revolution in steam engineering which their inventors promise, but gently drop out of sight and memory, it does not imply that they are all swindles and frauds. In some instances they are, but more often the inventor believes in himself and his work, and never fully understands why he fails where he expected such magnificent success.

The latest attempt to obtain by the use of bisulphide of carbon the theoretical economy which long ago attracted the notice of experimenters, was announced with loud proclamation, and, upon investigation, seems to be more deserving of critical notice than many which have preceded it. The plan is to use bisulphide of carbon in the place of water, from which to generate an elastic vapor to drive an engine. One of the great advantages of the liquid lies in the fact that it boils at a comparatively low temperature, and that for a small increase in temperature the vapor has a high pressure. The use of bisulphide of carbon alone for the production of power is by no means new, and many experiments have been made with it which were not altogether satisfactory. One of its chief disadvantages was found in its very remarkable affinity for oil, or fat of any kind. This rendered the question of lubrication a somewhat difficult one. Leakage past stuffing boxes also caused some annoyance and danger, as the vapor of bisulphide of carbon is very inflammable. For a variety of reasons the use of this substance as a means for obtaining power has been abandoned, and is not considered even a hopeful one by engineers.

The inventors of the latest method of using it have very ingeniously avoided some of the more prominent of the difficulties, and have apparently taken an entirely new direction. The engine used does not differ in any essential from the ordinary low pressure engine with a surface condenser. The boiler is of the usual type. In operation it is filled about half full with water, and on top of this is an equal quantity of petroleum according to the original plan. In practice, however, only a few gallons of petroleum are used. When at work the water is heated almost to the boiling point, the pump is then set to work and a small quantity of the bisulphide of carbon is thrown into the boiler, where it at once absorbs heat from the water and is converted into vapor. The pressure can be regulated to suit circumstances simply by the action of the pump, as none of the liquid is allowed to remain in the boiler. The petroleum at once saturates the bisulphide of carbon and thus destroys its great affinity for the lubricants, while for all the internal rubbing surfaces the bisulphide of carbon carries a great supply of oil along with it, either in the form of spray or vapor. After having passed through the engine in the usual way, the vapor is carried by the exhaust pipe to the condenser, when it is at once condensed and falls into the reservoir from which the feed pump gets its supply. The amount of latent heat is considerably less than that of water, and hence a comparatively small condenser may be employed. Very considerable pressures are obtainable without heating the water in the boiler to the boiling point. Under ordinary circumstances only a small quantity of the bisulphide of carbon is used at a time in the boiler, most of it being in the condenser and hot well. One hundred pounds, it is stated, would be an ample supply for a 15-horse-power engine. Of this the greater portion would be required to fill pipes, pump and connections. The market price of the material is about 15 cents per pound at present, but it is supposed that by taking large quantities it could be obtained for 10 cents or even less. In the foregoing we have endeavored to give as fair a statement as possible of the inventors' claims.

While a great many, if not all, the points claimed by the inventors are good, there are some others which require careful attention and are not favorable. The first of these is that the vapor of bisulphide of car-

bon is extremely inflammable, and when mixed with air it forms a very explosive compound. Some years ago an inventor experimenting with a bisulphide of carbon engine was blown across the engine room when he attempted to examine the inside of the cylinder with a lighted candle. The cylinder head had been taken off, and the vapor within had become mixed with enough air to make a very explosive compound, which was fired by the light. The liquid itself has an exceedingly foul and suffocating odor, which makes it very disagreeable to most people.

One of the great points of advantage claimed by the inventors is the economy, which they assert may be as great as 75 per cent. over an ordinary steam engine. Theoretically this may be possible in some cases. Indeed, if we arrange a bisulphide of carbon engine and a steam engine so that the exhaust steam of the latter heats the boiler containing the bisulphide of carbon, it is possible to obtain a horse-power with a consumption of only one pound of coal per hour. This arrangement, however, necessitates a very great degree of complication and heavy first cost in proportion to the amount of power obtained. The inventors in this case do not contemplate this, and do not propose to introduce double vapor engines. Of course when confined the vapor does not affect the external air, but unfortunately all engines will leak, and, so far as we know, all vapor or gases under pressure pass through stuffing boxes and small openings easier than steam. We may expect, therefore, that the bisulphide of carbon vapor will leak more easily than steam. The loss may be small, but the annoyance will be great. These are very serious objections, and it is doubtful whether a condensing engine driven by means of bisulphide of carbon vapor, under ordinary conditions, will show any considerable economy. While the vapor gives great and easily controllable pressures, it must be remembered that condensers and air pumps must be provided for all high-pressure engines before they can be made to use it. It is true that these condensers may be smaller than for steam, but still they are necessary, and are only about one-third smaller than would be needed for steam. We may say that all practical machinists and engineers who have worked with bisulphide of carbon engines have very little hope for the success of any experiments with it; and while there is still room for experiment, with a possibility that some of the difficulties now regarded as insuperable may in time be removed, the prospect is certainly a very discouraging one.

California Freight War.

The struggle among those who compete for the transportation of goods between the Atlantic States and the Pacific Coast has suddenly assumed a new phase. Just at the moment when merchants supposed that all hands had agreed to a truce, trade being left to its natural course, it turns out that the overland railroad companies and the Pacific Mail Steamship Company have been engaged in vain endeavors to harmonize their interests under a new combination, similar to that previously existing, when rates all round were advanced and strenuous efforts made to prevent shipments around the Horn. The rupture at last is complete, as appears from the following circular:

PACIFIC MAIL STEAMSHIP COMPANY, NEW YORK, January 29, 1880.

To Shippers of Freight to California.—DEAR SIRS: You are hereby notified that, on and after the 1st of February, this company will be prepared to name rates of freight from New York to San Francisco, via Isthmus of Panama, and to contract for same with shippers for the term of twelve months from that date. For rates of freight and further information, apply to H. J. Bulay, superintendent, at office of the company, foot of Canal street, North River, New York.

By order of the Board.

President Riley, when called upon by our reporter, stated, in substance, that it had been impossible to reconcile differences, and now the steamers of the Pacific Mail line would run independently, at such low rates of freight that they could not fail to do a large business, and they would take passengers at a reduction of 30 per cent. from the old schedule. The reporter suggested that the Union Pacific Railroad Company professed to fear nothing from the competition via Panama, as the steamships on the route were already carrying almost to their full capacity, and would be unable to do a larger business should it be offered. In reply, the president remarked that his company would be amply provided with steamers equal to the largest demand, and he had no misgivings in regard to the course which had been resolved upon.

It will be remembered that in the freight war of last year the Union Pacific Railroad Company used the Panama steamers for coarse freights, in opposition to sailing vessels going round the Horn. Now, it is understood among the clipper-ship folks that the steamers will raise the rates on coarse freights to economize space, and reduce the rates on the higher classes of merchandise, giving a better average than before and returning a better net income. It is reported among those in the trade that the Pacific Mail Company refused to renew the arrangement under which they received \$60,000 a month, and demanded \$100,000, which was rejected. At a later date, when the railroad company were inclined to accede to these terms, the Pacific Mail was "off." Then \$150,000 was demanded and \$125,000 offered, at which point negotiations ceased. This is the story. As yet the overland rates

remain without change, and merchants are curiously asking what will come next. The clipper-ship owners look on complacently, feeling sure of coarse freights in any event, which they can afford to take at low rates while going out for grain.

The Lake Superior iron ore companies and the Iron Mountain Company of Missouri, have fixed the price of ore for the season of 1880. The Republic Company, of Lake Superior, have named \$12.50 on docks for their specular, \$12.50 for the magnetic and \$11 for their Kingston ore. From \$12 to \$12.50 is the asking price for the Lake Superior hard ores, and \$10 for the soft hematites. The Iron Mountain ore is held at \$15 per ton at St. Louis. These, we believe, are the highest prices ever asked for a season's delivery of either ore, although some odd lots or some portion of the output may have been sold during one or two years for a little higher figure. The contracts for the season's delivery, however, have never equaled these rates. The vital question is, Can these prices be obtained? The producers say they can, and they allude in justification of their position to the report that the Iron Mountain Company can readily sell their entire output at the rate named, and then not supply the demands of their regular customers upon them. The Republic Company state that the applications from their regular customers are largely in excess of their supply. The quantity they offer (150,000 tons) includes 120,000 tons of specular, 17,000 tons of magnetic and 17,000 tons of Kingston ore. The other mines producing hard ore tell much the same story, the demand for this class for fix arising from the increased make of puddled iron and from the requirements of blast furnaces, which, with our method of hard blowing, must have hard ores, even though a portion of soft ore may be used. These facts render it probable that there will be a market for all the hard ores that will be produced in the West, and there is but little doubt that these ores will be readily sold and that the contracts will be made at once. With the soft ores it will be different. The bulk of the increase in the output of the Lake Superior regions will be directed to this class, and it is questionable if it will be possible to maintain the present prices. At least there will not be the same anxiety to place orders, and the chances of the future will be taken by many furnaces.

It will be a cause of great regret that the new French cable has already been crowded to the wall by the competition of the Anglo-American Company, which met the announcement of its opening with a reduction in rates from 75 cents to 12½ cents a word. The 12½ cent rate is too low and would ruin any company which should attempt to do business at it for any length of time. The Anglo-American Company could not stand it long, but they are presumably in a better shape to lose money than a new line just opened to business. What the managers of the new line will do is still uncertain. Since they are prevented by the conditions under which they enjoy the privilege of landing their cable on our shores from making an alliance with other cable companies, they seem to be forced to a choice between "the devil and the deep sea," literally. Their only course seems to be to fight it out, and meet the 12½ cent rate until the Anglo-American people are tired of it. It is an unpleasant, but perhaps an inevitable, alternative.

The Steel Rail Hearing.

WASHINGTON, D. C., Feb. 3, 1880.

About two weeks since the Chairman of the Committee of Ways and Means notified Mr. D. J. Morrell, president of the Cambrian Iron Works, who was in this city, that the Committee would grant a hearing on Feb. 2 to parties desiring to speak on the proposed reduction of the duty on steel rails from \$28 to \$10 per ton. A large number of gentlemen interested in the manufacture of steel were present at the rooms of the committee at the time indicated and heard the argument of H. V. Poor in favor of the reduction. Among the gentlemen present were D. J. Morrell, of the Cambrian Iron Works; Dr. Linderman and Joseph Wharton, of the Bethlehem Iron Company; S. M. Felton, of the Pennsylvania Steel Co.; Andrew Carnegie, of the Edgar Thomson Steel Works, Pittsburgh; O. W. Potter and S. P. Burt, of the North Chicago Rolling Mill; W. W. Scranton, of the Lackawanna Iron and Coal Co.; A. J. Leith, of Joliet, Ill.; D. H. Mason, of Chicago; Chester Griswold, of Troy, and Mr. Elliott. Mr. Poor stated that he represented a number of railroads interested in the purchase of steel rails, among these the New York Central, the Illinois Central and the Texas and Mobile railroads. He said that the iron and steel manufacturers had been receiving exceptional protection for 10 years, and that the time had now come to reduce the protection on steel rails in order to cheapen them to all railroads. He urged that if the tariff was reduced, foreign as well as American, rails could be bought at lower figures. He then entered at great length into a historical dissertation upon the railroad system of the United States for almost half a century. He was frequently interrogated by Messrs. Conger, Frye, Garfield, Tucker, Kelley, Mills and Dunne of the committee, whose questions elicited replies which went to show that the duty of \$28 a ton had not produced the injurious consequences represented by Mr. Poor.

A letter from William P. Shinn, of the Vulcan Iron Works, St. Louis, was read in which that gentleman advanced arguments in favor of the present duty. Emory Storrs,

of Chicago, and James F. Wilson, of Iowa, will represent the steel interest in favor of the maintenance of the duty at its present figure. Members of the committee, commenting upon Mr. Poor's argument, expressed the opinion that one object it had in view was to defend Mr. Vanderbilt from the charges made against him for his purchase of foreign steel rails, and that the principal object of the bill pending in committee was to release that purchase from duty, and with it similar contracts made for the future with foreign manufacturers.

The National Association of Stove Manufacturers.

The ninth annual meeting of the National Association of Stove Manufacturers began yesterday (Wednesday) at the Fifth Avenue Hotel, in this city. Gen. Rathbone, of Albany, president, was in the chair. The first day's session was largely taken up in listening to papers by Mr. John S. Perry, of Albany, Mr. B. F. Holbrook, of St. Louis, and Mr. J. R. Chapin, of Buffalo. A ballot for officers resulted in the following election of officers for the ensuing year:

President.—Gen. JOHN F. RATHBONE.
Vice-Presidents.—R. P. MEYERS and G. F. FILLEY.

Treasurer.—A. BRADLEY.

Secretary.—EDWARD BOWDITCH.
Board of Managers.—JOHN S. PERRY, W. H. TEFFT, JOSIAH JEWETT, I. B. RESOR, W. P. ABENDROTH.

Standing Committee on Patents.—ISAAC A. SHEPPARD, CHAS. A. MCLEOD, MILES PRATT, G. G. WOLFE, J. L. MOTT.

The attendance was very large, and great interest was manifested in view of the high price of iron and the relatively low price of stoves. The important business of the meeting comes in to-day's session, when it is probable some basis of prices will be agreed upon which will make the business more fairly remunerative than it has been since the advance in prices began. This is regarded as the most important meeting of the Association since 1872, when the condition of trade was much the same as it is to-day.

Scotch Pig Iron.

As the bulk of the foreign pig thrown upon the American market at the present time is Scotch, many have been obliged to replenish their stocks from this source, although they have little or no knowledge of the metal they have purchased, and of the manner in which it may be used to best advantage. How far the absence of such knowledge may be regarded as giving rise to numerous complaints of the quality of foreign pig, we are not prepared to state, but it is likely that the uses of Scotch pig are not as fully understood now as they were ten or twenty years ago. It is to be regretted that a large and important industry like the Scotch iron trade has never sought to give consumers a better assurance of the value of its product. The example of a number of prominent smelters of the Rhenish provinces and Westphalia, Germany, who combined to show, by tests and analyses, that their product was at least equal to Scotch pig for the very purposes for which the latter was chiefly bought, ought to have stimulated the Scotch ironmasters to effort in the same direction. They cannot expect that occasional customers would be accurately informed as to the best method of using the metal purchased, and they should follow the example of many manufacturers engaged in other branches of industry, in giving as full and accurate an account of the properties of their goods as possible under the circumstances. All departments of the iron trade which furnish raw materials will, we believe, in time be forced to give mechanical, chemical and working tests of their product, and it is likely that the manufacturers of pig for foundry purposes will be forced to fall into line before long. A strong effort has been made in this country by a few ironmasters—for instance, the makers of the Salisbury pig—and it is a notable and suggestive fact that those who have led the way in this direction have been the ones whose products were already in the enjoyment of a well-earned and wide reputation for inferior quality. The value of well-planned tests is now generally understood, and it is likely that, as the demand for such information increases, the means of providing reliable and conclusive data will be greatly enlarged and fully developed.

The main features which commend Scotch iron to the founder is that it is very gray and of great fluidity, while its shrinkage is comparatively low. There are a large number of brands of Scotch pig, among which we would mention Coltness, Langloan and Summerlee, of which the two latter are little inferior to the first, which is considered the best brand of Scotch pig. A second class of irons which rate approximately equal to one another are Glengarnock, Gartsherrie, Carnbroe and Shotts, while Monkland and Govan are rather poor for foundry purposes, and are better adapted for forge purposes. Eglinton is rated as fourth class pig. Within certain limits, of course, the quality of these brands necessarily varies, the metal produced during the summer months being harder than that made during the winter. We may add that old and shrewd Scotch founders express a strong preference for old pig; that is, metal which was made many years since. The following analyses, of which the first was made of Coltness No. 1 and the second of Langloan No. 1, may serve to give an idea of the chemical composition of Scotch pig of the better grade:

Coltness. Langloan. Scrap.

	No.	Tonnage.	No.	Tonnage.
Silicon	4,386	4,820,473	5,553	5,044,310
Phosphorus	0.98	0.75	0.92	
Sulphur	0.02	0.04	0.03	
Graphite	3.30	3.40	2.82	
C. Carbon	0.22	0.46	0.58	
Manganese	1.58	1.02	0.72	
Copper	0.10	0.07	0.05	
Iron	90.24	90.51	92.55	

	No.	Tonnage.	No.	Tonnage.
Silicon	3.50	0.03	2.50	
Phosphorus	0.98	0.75	0.92	
Sulphur	0.02	0.04	0.03	
Graphite	3.30	3.40	2.82	
C. Carbon	0.22	0.46	0.58	
Manganese	1.58	1.02	0.72	
Copper	0.10	0.07	0.05	
Iron	90.24	90.51	92.55	

The average composition of Scotch pig has been stated by good authorities to be 2.5 to 4 per cent. of silicon, 3.5 to 4 per cent. of graphite, 1 to 1.5 per cent. of manganese and 0.8 to 1.0 per cent. of phosphorus. Some very interesting experiments were made some time since in Germany with Scotch pig, and from the records of these tests,

conducted by the late Herr Wachler, of Gleiwitz, we take the following data: Trial meltings of Coltness and Langloan pig, composed as given above, were melted with scrap from both, which contained the impurities enumerated in the above with 40 per cent. of this scrap. Coltness pig yielded a metal having a tensile strength of 8.4 tons per square inch, while with 50 and 60 per cent. of scrap, the figures were 8.69 and 9.43 tons per square inch, respectively. Langloan pig was melted with 40, 50 and 60 per cent. of the same scrap and yielded metal having tensile strength of 8.80, 8.85 and 10.31 tons per square inch respectively, the iron flowing very thin in each case. The higher grades of Scotch pig, which are produced by melting calcined black band and pure red specular ores with raw coal, all melt easily and flow well, and they possess the valuable property of remaining gray even in thin sections, so that they are easily worked by machine tools. The cheaper grades have frequently an excessive amount of silicon, from 4 to 5 per cent., or their quality is impaired by too high a percentage of phosphorus. Scotch pig is, therefore, largely used in England, on the Continent and in this country, in order to counteract by its presence the injurious effects of other grades of metal. Its high percentage of uncombined or graphic carbon makes it particularly suitable for mixing with light gray qualities of charcoal iron, or with old foundry scrap or sprues, of which it will carry considerable quantities. Melted by itself, No. 1 Scotch pig has a shrinkage of one part to 135 parts, or about eight-tenths of 1 per cent., which is a comparatively low figure.

Technical Education in Philadelphia.

The Philadelphia *Ledger* says: The Technical Schools of the Spring Garden Institute, Board and Spring Garden streets, were opened Monday evening without any ceremonies, the first class of 10 pupils being simply set at work "flat-filing" under the instruction of Mr. John Hall, a practical mechanician. Dr. Robert Grimshaw has charge of the schools, under direction of a committee of the board, composed chiefly of practical mechanics, two of whom are foremen in the Baldwin Locomotive Works. As the school was somewhat of an experiment, only five double work benches were erected in a broad corridor on the third floor, giving accommodations for 30 pupils in three night classes of 10 each. Over 50 applications for admission have been received, however, and apprentices in the Baldwin Works have formed a class among themselves, and desire to be admitted in a body as soon as accommodations can be furnished. It is probable, therefore, that the work-benches will be removed to a larger room on the floor, and new ones erected, giving accommodations for more pupils. Each bench is fitted with vises and furnished with tools, materials, &c., for the use of the pupils. Some of the vises and tools have been presented to the Institute by manufacturers desirous of encouraging the managers in organizing the school. The first course of instruction will include filing and chipping with all kinds of metal.



SCUTT'S PATENT FOUR-POINTED STEEL BARBED CABLE FENCE WIRE.

The cable is formed in the same manner as the great cables used in bridges, and has a tensile strength double that of any twisted wire. It is the only barbed wire so manufactured. Both wire and barb material are manufactured especially for our use from the finest grade of Siemens-Martin steel. Our wire offers double the protection afforded by any two-pointed barb, each rod giving 128 points, while two-pointed bars give but 64. It is the most attractive in appearance, and the best selling wire in the market, and, by actual tests, the strongest, lightest and consequently the cheapest.

We manufacture under license from the Washburn & Moen Mfg. Co., and all danger of law suits is avoided in the purchase of our goods. We manufacture both painted and galvanized.

The only Solid Steel Four-pointed Barb. Send for circulars and price list.

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OF
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In the World.

Are kept in stock by nearly every Jobber in Carriage Goods in the U. S., and sold at Manufacturer's Prices, and at a saving in freights.

The Most Durable and Best Selling Bucket for Chain Pumps.

It has no valves to become obstructed and no screw joints to become immovable by rust.

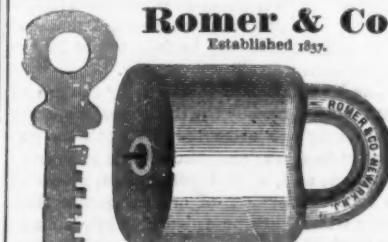
Advantages of the Crosby Bucket over all others:

1. It has an air chamber on top, which conducts the air to the bottom of the bucket.
2. It is self-expansive, the base of the bucket being $\frac{1}{4}$ of an inch greater in diameter than those in the tubes, which allows it to expand, and to grip more firmly on the side to contract.
3. The wear comes on the whole side, instead of on the extreme edge like other buckets.
4. It contains more sand than three of any other manufacturer.

No charge for territorial rights. Send for Price List. Agents wanted in every county. Address A. D. CROSBY, Patentee and General Agent, Cuba, Allegany Co., New York.

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Established 1859.



Manufacturers of Patent Scandinavian or Jail Locks, Brass Pad Locks for Railroads and Switches. Also Patent Stationary R. R. Car Door Locks. Patent Piano and Sewing Machine Locks.

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Manufactured by FRAY & PIGG, Bridgeport, Connecticut, U. S. A.

All Iron, Four Sizes.	Rosewood Head and Handle.
NO. 7... 7-inch sweep.	NO. 107... 7-inch sweep.
" 10... " "	" 108... "
NO. 10... 10 "	NO. 110... 10 "
NO. 12... 12 "	NO. 112... 12 "
NO. 14... 14 "	" "

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Manufacturers of Copper, Brass, and Iron Rivets; Common and Swedish Iron, Leathered, Carpet, Lace and Glass Tacks; Finishing, Hungarian, Trunk Clout and Glass Box Nails etc. Rivets made to Order.

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OF A SUPERIOR QUALITY AND FINISH.

From Wellington Mills Emery, also from Hampton Emery. All goods warranted as represented. Send for Price List.

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Agents wanted in every sugar District to carry this for the sale of Post's Patent Metal Eureka Sap Spout and Bucket Hanger. Samples Circular and Terms sent postpaid on receipt of 20 cents. Address C. C. POST, Manuf. & Patente, Burlington, Vt. Call for them at your hardware stores.

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Diploma awarded at Mechanic Fair, Boston, 1876. Hole bored any depth, and countersink of any size, screw at one operation, and the counterbore in quantity. D. B. BARBER, 132 Washington St., Boston.

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Manufacturers of the well-known brands of

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Steel Grass Scythes.

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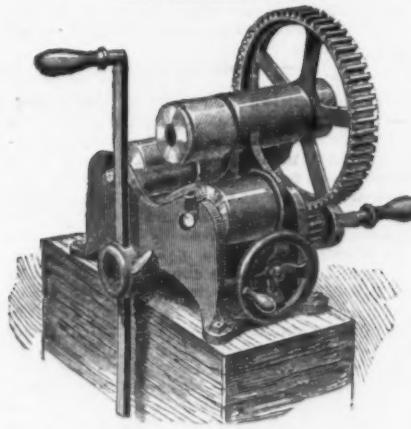
Common Pattern & Spear Point Hay Knives.

ALSO

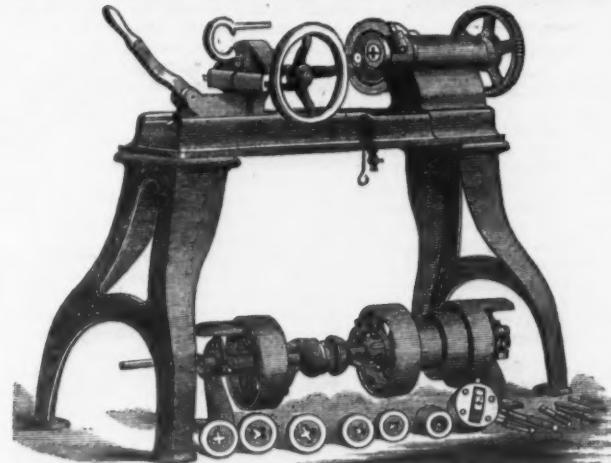
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WILEY & RUSSELL MFG. CO., LIGHTNING SCREW-CUTTING MACHINERY and GREEN RIVER TOOLS.

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Send for Illustrated Price List.



THE MACKENZIE PATENT CUPOLA & BLOWER.

Send for circular to

Smith & Sayre Mfg. Co.,

PROPRIETORS, 21 Cortlandt St., New York.



This Cupola has made a great revolution in melting iron. It differs from all others in having a CONTINUOUS TURBINE, or in other words, the blast enters the fuel at all points. Above one ton capacity per hour, they are made oval in form. This brings the blast to the center of the furnace with the least resistance and smallest possible amount of power, and in combination with the continuous turbine, gives a large amount of diffusion of the air, and a more uniform temperature, melting ten tons or fifteen tons per hour with the pressure of blast required to melt two or three tons in an ordinary Cupola. It also enables us to save very largely in time and fuel, the experience of our customers showing a gain of twenty-five to fifty per cent. In time and fuel, we have a better quality of castings, and a BETTER QUALITY OF CASTING, especially in light work. This is due to the thorough diffusion of the air and more perfect combustion of the fuel, leaving no smoke or fume, and giving a softer and tougher casting.

We manufacture these Cupolas of any desired capacity, numbered from 1 to 20, inclusive, the numbers indicating the tonnage per hour. No. 1, one ton.; No. 2, two tons.; No. 3, three tons per hour, and so on up to 15, or 20 tons. We have improved the construction of these Cupolas, and have increased their strength and durability, and sought to make them as convenient for working and repairs as our own and the experience of our customers could suggest.



The Original and Genuine.

ALL OTHERS ARE IMITATIONS.

OVER 100,000 NOW IN USE.

JEWETT'S PATENT WATER FILTER

With Porcelain-Lined Cooler.

ACKNOWLEDGED THE ONLY COMPLETE AND SUCCESSFUL FILTER AND COOLER IN THE WORLD.

ISAAC S. WILLIAMS & CO., 728 Market Street, Philadelphia, Pa.—We have sold your "Patent Water Filter" for the last six years. Our sales in that time having reached upwards of five thousand, and in no instance have we heard of any failure in performing all you claim for them.

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NEW YORK STATE AGRICULTURAL WORKS, Established 1830.



Jointed Pulverizing Harrow.



Eagle Rake.

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Patentees and Manufacturers of

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Ellis's One and Two-Horse Threshers and Cleaners, Threshers and Shakers, Straw-Preserving Rye Threshers, Eagle Hand and Horse Dumping Rake; La Dorr's Jointed Pulverizing Disc Harrow, the only Disc Harrow that will thoroughly pulverize the ground, leave it smooth and cover the seed; Tolley's Champion One and Two-Horse Cultivator with patent screw teeth Steam Engines, Dog and Pony Powers, Wood Sawing Machines, Shingle Machines; La Dorr's Disc Corn Cultivator, unequalled by anything for cultivating corn or any rowed crop. All machines made of first-class material, and are the best machines for export and home trade. Having been established nearly fifty years, our reputation is second to none.

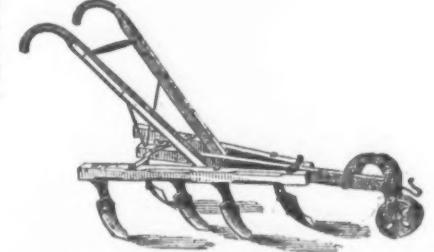
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WHEELER & MELICK COMPANY,

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Horse Power and Thresher and Cleaner.



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THE HARTFORD AUTOMATIC PUMP

Water Driven to any Height and Distance by Compressed Air.

Country Houses Supplied Cheaply and Certainly for Bath Rooms, Water Closets, Hot and Cold Water Faucets, &c.

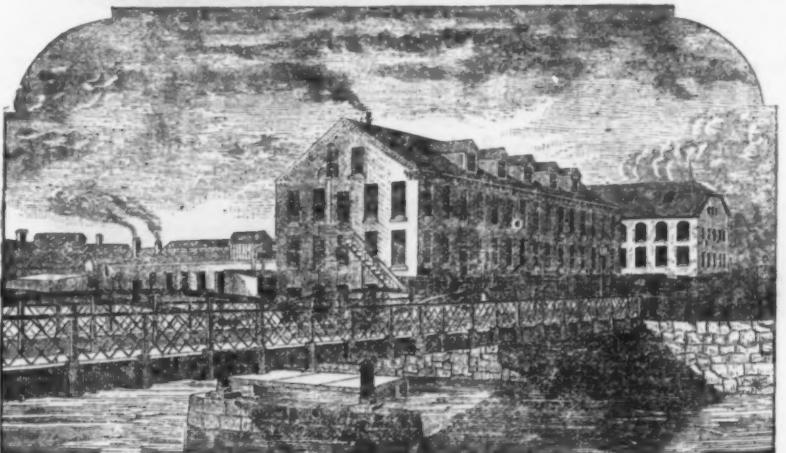
Plenty of Fresh Water for Stock on Farms.

The Best Pump for Irrigating, Supplying Railroad Tanks and for Mining Purposes.

This pump is being introduced into all the foreign countries, and is accepted by all mechanical men as the very best Pump in the market. It is more durable and needs less repairs than any other apparatus for like purposes, and is therefore the cheapest in the end, if not at first. Its advantages over other Windmills, Rams, and other contrivances for raising water, are quickly seen. For Circular and Price List address

EZRA BROOKS, Manufacturer,
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SEYMOUR'S SHEARS AND SCISSORS.



HENRY SEYMOUR CUTLERY CO.,

MANUFACTURERS OF

Full Nickel Plated and Maroon
Japan Handle

Shears & Scissors

EVERY PAIR WARRANTED.

Sold by Hardware dealers throughout the country.

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End View of Track.

Made of two pieces.

All Wood Track.

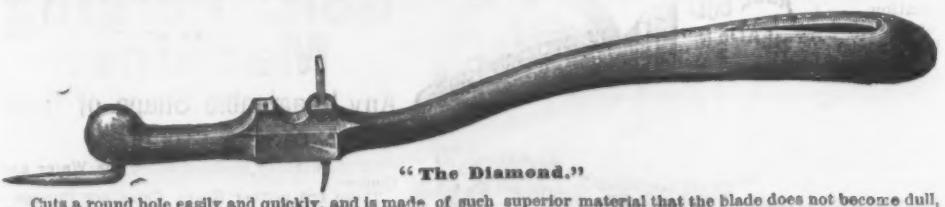
Patented April 30,
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THE KIDDER SLIDE DOOR HANGER.

No Iron Rail and Cannot be thrown off the Track,

Thereby saving great annoyance to the user and cost of iron rail. The small anti-friction wheel keeps the door in place, preventing side friction. The Hanger can be put up in less time, runs with less noise and as easily as any other hanger made. For sale by the Wholesale trade generally, and the

KIDDER SLIDE DOOR HANGER CO., Romeo, Mich.



"The Diamond."

Cuts a round hole easily and quickly, and is made of such superior material that the blade does not become dull, as is the case with all round hole cutters introduced heretofore. The blade is readily adjusted to cut a circle from $\frac{1}{2}$ to $3\frac{1}{2}$ inches in diameter.



Iron Handle, "No. 5."



"American."

CAN OPENERS.

The illustrations represent three different styles of Can Openers made by us. We desire to "close out" stock on hand and cease making. In lots of 10 gross and upward we will bill at very low prices.

SPRAGUE NOVELTY WORKS, Rochester, N. Y.

The Braunsdorf Electric Light.

Now that prosperity has overtaken many of the leading interests of this country, so suddenly that many manufacturers are not in position to meet the demand upon their facilities unless they extend their working hours into the night, the question of providing for the illumination of large spaces in an efficient manner has become one of importance to them. The developments made in the last few years with illumination by electricity, therefore, assume much importance, and it will be of interest to place before our readers the details of an apparatus which is specially designed to meet this growing demand. It will be remembered that two methods of producing the electric light have been developed, the one being based upon the property of an electric current of heating intensely any portion of the conductor which offers it resistance, and the other depending upon its property to create a luminous arc if the circuit is interrupted entirely at any one point. To the former class, the lights by incandescence, belong the Edison, Sawyer, Mann and others, while the latter class includes the great number of systems using carbon rods. The Braunsdorf system, which we have had occasion to examine recently, is included in the latter, the light being produced by the passage of a strong current of electricity between the two points of carbon rods, kept apart at a certain distance by an automatic regulator. The dynamo-electric machine used by Messrs. Braunsdorf & Co., shown in the accompanying illustration, consists of a pair of electro-magnets, between which an armature revolves. The latter consists of two series of thin plates, which alternate with one another. One system is so constructed that each plate bears 60 projections, which are separated by the thickness of the second series of plates. Three of these washer plates have inside projections, which serve as guides for the bobbins of wire, wound transversely, each

such lights are apt to mislead those unacquainted with the nature of the light produced by the voltaic arc. They create the impression that one light may suffice for the illumination of larger spaces, and have, we believe, largely contributed to disappointment in the results obtained by the use of strong electric lights. A limited area is usually flooded with light, while at a greater distance the effect is by no means satisfactory. As an illustration, we may state that a room 35 feet by 35 at the factory at Pearl River required for its illumination, which was far superior to that of gas, a machine rated at least 2500 candles, and using about 1½ horse-power. A long room in the shop, 260 feet by 35, was illuminated by five open lamps, each of which was equal to 5000 candles, and while the effect was highly satisfactory, it would have probably required two additional lamps to illuminate the space uniformly throughout and diffuse enough light to relieve dark shadows.

A Remarkable Spinning Machine.

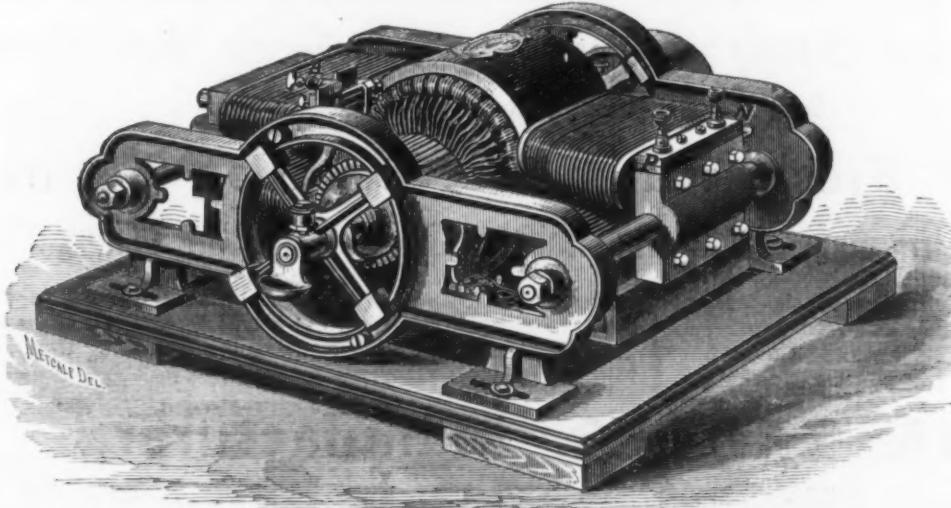
A correspondent of the Louisville Evening Post and News tells the following story, which, if true, is of much interest, concerning a machine invented by one Clements, which spins yarn directly from seed cotton:

This machine consists of a 36-inch top-flat, self-stripping card; the attachment (which is a diminutive gin 18 x 18 x 36 inches) is substituted for the licker-in and feed rollers of the card; its saws are 7 inches in diameter, with 14 teeth to the inch, and revolve from 100 to 200 times per minute. The brush connected with the saws is a cylinder covered with bristles; its periphery revolves little faster than the saws, and has also a traverse or horizontal motion. The periphery of the card travels a little faster than the brush; a feed table is placed above the card and connected with the attachment by a chute, and gives a regular supply of seed cotton to the attachment. A stop-motion is used to save waste in case of ac-

tuating qualities perfect; and the fact that it has never been nap, cut nor tangled by the gin, pressed, compressed, or permitted to become dry, seasoned and brittle in this tangled condition, nor has it been injured by the willow, lopper, double lopper, breaker and cards, where the damage done by the gin, press and compressor are sought to be remedied. But these advantages, great as they are, are not half what they are claimed for the "new process."

The ginning, baling, bagging and ties are saved; the seed inure to the manufacturers; no loss from falsely packed cotton, no strikes among operatives, for it is the poor man's factory, and his daughters are the operatives. The cost: The entire capital necessary for the smallest size new process mills, including building and motive power, is only \$3500, and will pay a net profit of 30 to 50 per cent. per annum. (See report of Westminster Mills, at Westminster, S. C.) It saves all expense, loss, waste, drayage, perquisites, general average accounts, steaming and speculation, &c., on cotton in transit from the field to the factory, be that distance 15 or 15,000 miles, as from India to Manchester, England.

Take a bale of cotton on a farm near Corinth, Miss., and see the expenses, &c., in sending it via Memphis to Boston, Mass. Hauling to Corinth, sampling, weighing, deduction of from 2 to 4 pounds from each bale's actual weight, profits to purchaser, freight and insurance to Memphis, drayage to cotton shed, storage, insurance, dress sampling, commissions for selling, general average accounts, brokerage for buying, dress boring, second weighing, repairs, drayage to compress, compressing, drayage to steamer or depot, freight and insurance to Boston, loss on bills of exchange, &c. To these add waste, loss, damage, drayage and steaming, all the expenses, speculations, &c., of the guerrillas of the South and the great cotton kings of the North, also the expenses in our seaport towns (where it is, or was, or recompressed



THE BRAUNSDORF DYNAMO-ELECTRIC MACHINE.

one of which corresponds to the space between two projections. The length and the thickness of the insulated wires used for each bobbin vary with the size of the machine, and it is only necessary to note, in this connection, that the armature is exceptionally large for this class of dynamo-electric machine, and that the clearance between the revolving armature and the electro-magnets is very small. The object of constructing the armature in the manner outlined is to give the air access in order to cool it, and we have had occasion to convince ourselves that, after several hours running at a high speed, the machine was not heated to any injurious extent. The commutator is so constructed that it will run for long periods without showing any irregularity of surface, a result which has been aided by the recent introduction of spring plates instead of commutator brushes. These plates are furnished with a brass cross-piece, readily removed, and if worn, replaced at a small expense. Even if running at a high speed, very few sparks are visible in the commutator.

The lamp used by Messrs. Braunsdorf & Co. differs from the greater number of those constructed hitherto, chiefly in regard to the simplicity of the regulator mechanism. The carbons are held by simple sockets, the positive carbon being the upper one and the negative the lower. The upper carbon holder is a heavy brass rod, toothed for the greater portion of its length. The clock-work regulating its descent is controlled by a lever, to one arm of which is attached the armature of an electro-magnet. The lower negative carbon is withdrawn by simple mechanical means as soon as the armature is attracted. The exact movement can be regulated to suit the speed of the machine by a set-screw on the lever. Numerous experiments have been made in order to produce a satisfactory mixture for the material from which the carbons are made. The prepared mass is strongly compressed in a Ferris and Miles hydraulic press, which delivers the rods true to shape and of any desired length.

Messrs. Braunsdorf & Co. make a variety of dynamo-electric machines of different sizes and patterns, both upright and horizontal. The greater number are single circuit machines, but a few have been turned out for two circuits, capable of supplying electricity for two lamps. The largest, which is now building, has magnets weighing 200 lbs. for a light rated at 25,000 candles, which, it is estimated, will require 7 to 8 horse-power. We have had occasion to examine with apparatus in the possession of the manufacturers at their works at Pearl River, N. Y., a number of machines of different power. The smallest one made, costing \$50, and used chiefly for laboratory work, showed by photometric tests a power of at least 2000 candles and required, running at 1500 revolutions per minute, about one horse-power. It is necessary to note, however, that statements as to the power of

incident. These, with a small drawing roller between the doffer and calender rollers, to reduce the sliver to the ordinary working size, and a cam motion to receive said sliver, are all the changes and additions made to the card, and there are none made elsewhere.

The seed cotton is spread upon the endless apron of the feed table, and passes thence through the chute into the attachment, where the lint is removed from the seed, and while on the fine saw tooth (after passing the ribs) passes through a set of combing plates, which removes all extraneous matter, and delivers the filaments to the brush, which delivers them to the card, and thence through the doffer, small drawing and calender rollers, delivered as perfect sliver into a revolving can.

By this process only four machines are necessary to convert any given amount of seed cotton into perfect yarns—viz.: card, as changed, drawing frame, sceder, and spinning frame. It is true a cleanser of seed cotton is used as a preparatory machine.

Its size is 22 x 28 x 44 inches; cost, \$75; capacity, 6000 pounds of seed cotton per day;

power necessary to drive, one-half of one horse.

The new process dispenses with fully one-half the building, machinery, motive power, and operatives hitherto necessary to convert any given amount of seed cotton into yarns; causes the card, with the same amount of motive power, to do five times as much work; saves one-half the usual waste, and produces stronger sliver rove and thread than can be made of baled cotton, which, on account of their extra strength, seldom break or let down, thereby enabling operatives to attend more machinery and each machine to do more work. The thread is equal in every respect to that made of baled cotton, 50 per cent. stronger, and more sheen.

The attachment supersedes the gin, press and compressor, because they are intended and only used to render cotton transportable; the willow, lopper, double lopper, breaker, and four-fifths of the cards, because they are only used to try to remedy the injury done by the gin, press and compressor; it supersedes the railway, railway drawing-head, also all jack frames, shubbers, mules, twisters, eveners, &c., simply because they are costly and unnecessary machines, and perfect thread can be made without them.

The reason why the card will do five times as much, using seed cotton and the same amount of motive power, as it did by the old process, using baled cotton, is because the filaments are not permitted to leave the machinery, fly or become tangled, but are kept straight and parallel, and carding is but the straightening of the cotton filaments. The saving of one-half the usual waste is because fresh, live cotton is used, and half the usual machinery dispensed with. The extra strength of the thread and skein is owing to the working of the cotton fresh from the seed, the oil of which has kept it alive, light, elastic and flexible, with all its

to be shipped to Europe), the expenses and profits of the shipment, and the expenses after its arrival there until it is sold to the manufacturer. Now, if to all these you add the expenses and profits of the shipment, and the expenses after its arrival there until it is sold to the manufacturer; and if in addition you add the expenses, profits, &c., of the manufactured goods returned South, you will have some idea of what middlemen receive, and what the new process will save, when generally adopted, to our impoverished but still beloved South.

American Pumps in Australia.

At the late Exhibition of the Agricultural Society of New South Wales, a silver medal was awarded to the Hartford automatic pump, of which one of the smaller size was placed on exhibition. The jurors in their report say:

"To enable the judges to test the power of the automatic pump, the agents obtained the mayor's permission to erect the apparatus at Moore Park. The pump was placed in the lagoon on the north side of Cleveland street, and communicated by a half-inch air pipe 52 feet 6 inches long with the motive power, a small windmill erected on Mount Steel at a height of 87 feet 10 inches above the pump. A discharge pipe, 1 inch in diameter and 1172 feet long, was laid from the pump to the top of Mount Renny, rising to a height of 60 feet above the water level in the lagoon. Several outlets were provided in this pipe to test the quantity of water raised at the different heights.

"With a stiff breeze, the discharge of water at the top of Mount Renny was equal to 150 gallons per hour, but the discharge was considerably greater at the lower openings, which, when open, were running full bore with great pressure.

"We consider the trial of the Hartford automatic pump most satisfactory, and that the work performed by this apparatus is far greater than that done by any other pump for the power expended, particularly when the friction in a small pipe 1172 feet long, discharging at a height of 60 feet above the water-level, is taken into consideration.

"The motive power is a small windmill with fixed fans and rudder, strongly put together, which cannot easily get out of order, as the wind-wheel only compresses air, which forms an elastic resistance to the piston of the air-pump. This compressed air, pumped at each stroke into the submerged cylinder or buckets, is then used to force the water as required.

"The air pump is very simple in construction, and is inclosed in the iron standard supporting the wheel, so that no joints or moving parts are exposed to the weather. The compressed air is conducted by a small pipe to the two oscillating cylinders, or buckets, which are provided with valves at the bottom to admit water, and with a slide valve at the top. The air is forced into one

cylinder until the latter has a tendency to rise, the oscillation changing the slide-valve and allowing the compressed air to be instantly diverted to the opposite cylinder, forcing the water contained in it through the discharge pipe. When certain amount of water has thus been expelled, this cylinder becoming higher than the other has a tendency to rise, and by its oscillation produces a continuous stream in the discharge pipe.

"The air pump is provided with a safety-valve, which is easily adjusted to raise the water to the height required.

"The Hartford automatic pump has been introduced in this colony by the agents, but we believe that it has been successfully used for some time in America. From the satisfactory result obtained at the trial at Moore Park this pump seems well adapted for raising water from deep wells, springs, rivers or swamps, without labor, for the irrigation of fields, or for the supply of farms and stations, or for public institutions in the interior.

The Middlesex Company, Lowell, Mass., last month repeated their generous conduct of a year ago, and paid their help 5 per cent. dividend on their wages if they have been employed six months consecutively there.

The Riverside Glass Works, at Wellsburg, W. Va., commenced work on the 26th ult. They are running slowly, getting the molds into shape, and expect to be in good running order this week.

BUFFALO SCALE CO., BUFFALO, N. Y.

Manufacturers of
H. R. Track Scales, Hay Scales, Coal Scales, Grain Scales, Platform Scales, Counter Scales, &c.

Send for price list, stating what you want.



Also the Standard Weight Positive Lubricator

Patented April 22, 1879.

Feed according to speed of 1 lb. per pound.

No drip, no danger of fire. Cheapest and cleanest. WARRANTED NOT TO GUM.

W. J. FAUL, Patentee & Sole Manufacturer, 218 Centre St., New York. Send for circular.

TATE & COMPANY, MANUFACTURERS OF BRAIDED WIRE PICTURE CORD, ALSO BONNET AND WAX FLOWER WIRE,

364 Atlantic Ave., Boston. These goods were awarded the only premium at the last exhibition of the Massachusetts Charitable Mechanic Association.

W. R. OSTRANDER, Manufacturer of PATENT Speaking Tube Whistles, Bell Hangers' Hardware. Send for revised catalogue. 19 Ann Street, New York.

ANCHOR BRAND AXLES.

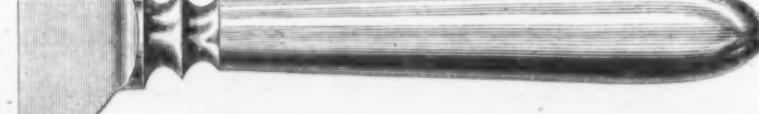
For all styles carriages and wagons. Annual production 180,000 sets.

SHELDON & CO., Auburn, N. Y.

GREENFIELD TOOL CO.

(GREENFIELD CUTLERY CO.)

Greenfield, Mass., U. S. A., MANUFACTURERS OF

**Fine Table Cutlery.**

Solid handled, bone, ivory, rubber and wood, solid steel silver plated.

**PATENT CONCAVE FORGED OX SHOES.**

ALSO,

PLANES, PLANE IRONS, &c.

C. P. MOORMAN, Prest. J. MORGAN COLEMAN, V. Prest. L. G. QUIGLEY, Sec. and Treas.

COLEMAN ROLLING MILL CO., Lessees Louisville Rolling Mill,

MANUFACTURERS OF

BAR, BAND & SHEET IRON,

T and Tram Railroad Iron, 10 lbs. to 40 lbs. per yard, and

DEAN & COLEMAN PATENT RAIL.

Office, No. 45 W. Main St., Mill Brook St., LOUISVILLE, KY.

THE "ABBE" PATENT Bolt Forging Machine.

Any Imaginable Shape of Head can be Produced.

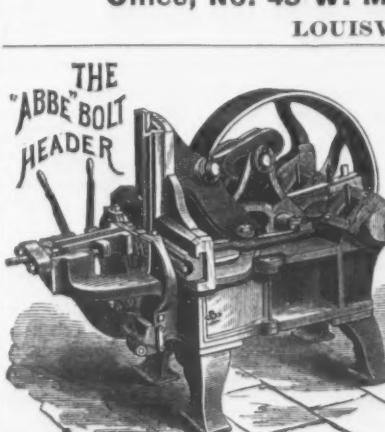
All its working surfaces above the Water and Cinder.

There are neither Gears, Cams nor Springs—every motion being positive. For particulars address

S. C. FORSAITH & CO., Manchester, N. H.

Also Manufacturers of

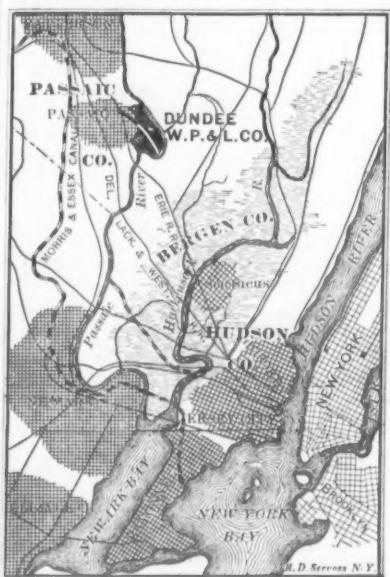
The "Pamer" Power Spring Hammer.



VALUABLE MANUFACTURING SITES TO LET.

The Dundee Water Power and Land Company,
OF PASSAIC, NEW JERSEY.

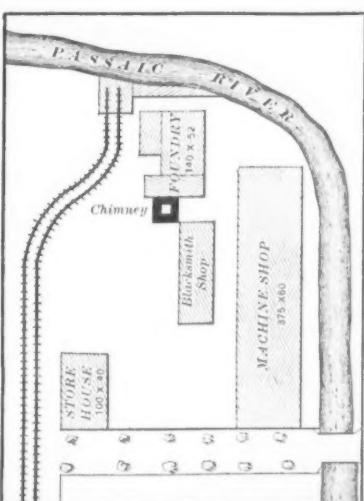
Offer to manufacturers one of the most desirable situations for the establishment of manufacturing industries in the United States, on most favorable terms.



Map showing advantageous location of Passaic, N.J., as a manufacturing center.

The property of this company is located at Passaic, New Jersey, at the head of navigation of the Passaic River, only 12 miles from New York and 4 miles from Paterson. It is located directly on the line of the New York & Paterson Railroad, dam and canal, both constructed in the most permanent manner, the entire water power of the Passaic River is conducted to the company's mill sites, by way of the canal, a fall of two and one-half feet. Competition by both river and rail insures the lowest rates of freight transportation, and the close proximity of several large manufacturing cities, viz., New York, Paterson and Newark, affords great advantage in respect to labor. There is at present in operation a dozen manufacturing establishments, giving employment to a large number of workmen, the location is perfectly healthy, cost of living is cheap, and there are good churches and excellent schools. Cheap illuminating gas and healthy city water are also to be had. The permanency of the mill water power is assured. The water is delivered to each mill through a canal 80 feet wide.

Among the manufacturing establishments at present located on this property are the New York Steam Engine Co., now for sale owing to a dissolution of the company. The works comprise eight substantial one and two-story brick buildings, and consist of Manufacturing Office, 175 feet long by 40 feet wide; Pattern Shop, 100 by 40 feet; Shop, 80 by 40 feet; Brass Foundry and Boiler Rooms, of about 20 by 20 feet each, together with additional smaller buildings, called the Power House, for the generation of power, and Fire Engine House. The works are located directly on the Passaic River, with good depth of water. In every respect this location is particularly desirable for manufacturing purposes. Liberal terms will be made by the company with desirable parties. Full information will be furnished by mail or personally by application to

JOHN B. PUTNEY,
Sec'y D. W. P. & L. Co., PASSAIC, N. J.

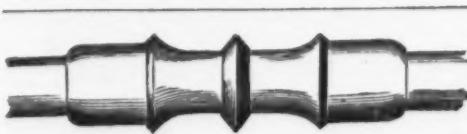
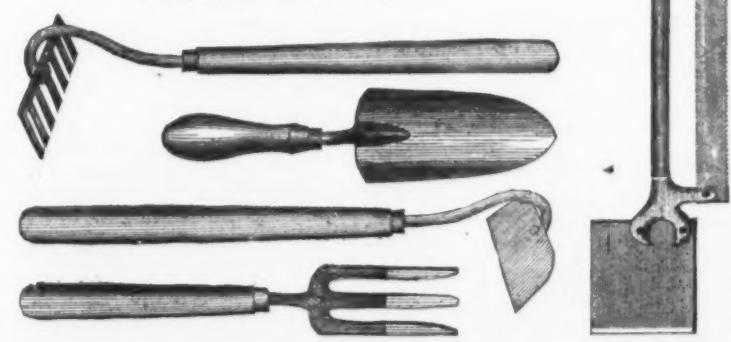
Plan of the works of the New York Steam Engine Co., offered for sale.

C. W. Dunlap & Co.,
43 CHAMBERS ST., NEW YORK,

MANUFACTURERS OF ALL KINDS OF

GARDEN TOOLS

Catalogues furnished on application.

WM. R. HARTIGAN, Burlington, Ct.,
Manufacturer of all kinds of

Tool Handles & Seat Sticks for Carriages, &c.

Also all kinds of ENAMELED GOODS MADE OF WOOD, such as

DROP KNOBS, FURNITURE KNOBS, ORGAN STOPS, BRUSH HANDLES, &c., &c.

Also sole manufacturer of the

PATENT ANTI-NERVOUS TRIANGULAR PENHOLDER.

Send for Catalogue and Price List before purchasing.

Manufactory at

BURLINGTON, Conn., U. S. A.

F. R. EMMONS, Agent,

132 Duane St., New York.



Important to Railway Companies, Cities and Mine Owners.

BLAKE'S
CHALLENGE ROCK BREAKER
OR
Sectional Cushioned Crusher,

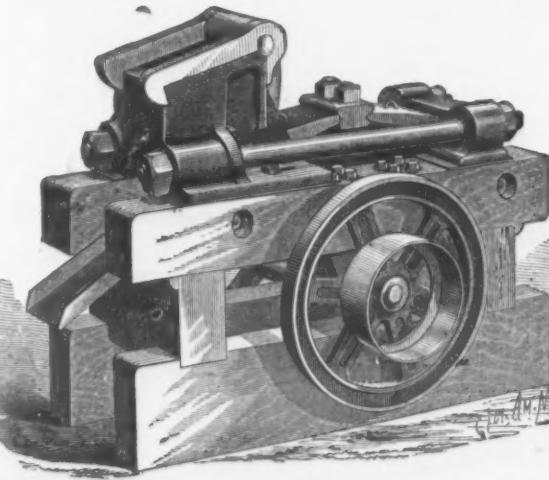
Patented Nov. 18, 1879.

Will be found the most economical and reliable crusher ever offered to the public for crushing
RAILWAY BALLAST, ROAD METAL,
STONE FOR CONCRETE, QUARTZ,
FLINT, EMERY, CORUNDUM,
FELDSPAR, BARYTA,
MANGANESE, PLASTER,
SOAPSTONE, &c., &c.

This machine dispenses with cast iron frame and pitman of our old forms.
All strains are on wrought iron or steel.

Over 50 Medals, including Paris Gold and Silver Medals.

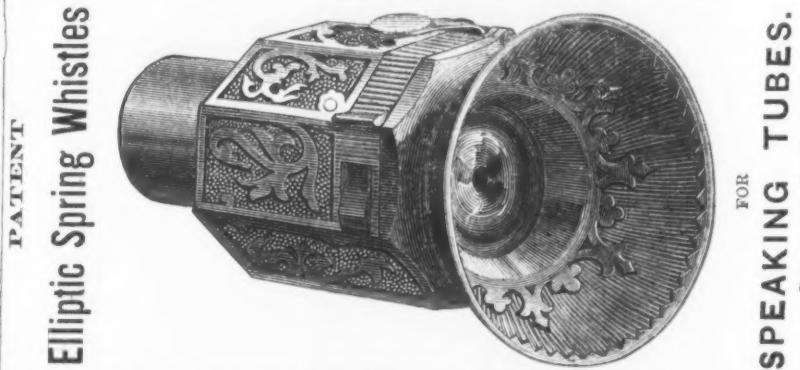
ADDRESS

BLAKE CRUSHER CO., Sole Makers,
New Haven, Conn.

BUCK BROTHERS, Millbury, Mass.

The most complete assortment in the U. S. of
Shank, Socket Firmer and Socket Framing Chisels,
PLANE IRONS.

Gouges of all lengths and circles beveled inside and outside. Nail Sets, Scratch and Belt Awls, Chisel Handles. A full stock of Carving Tools. Also, small boxes of Tools of best quality.

FOR
SPEAKING TUBES.
Patented April 3rd, 1879.PATENT
Elliptic Spring Whistles

We call the attention of the trade to the whistle for speaking tubes, represented in above cut, as being superior, in a mechanical point of view, on account of the

PATENT ELLIPTIC SPRING,

which is much less liable to break and get out of order than the spiral spring usually used. These whistles being made entirely of metal, are very strong and durable. They are offered in a variety of styles at very reasonable prices. Send for illustrated circular and quotations.

We also invite an examination of our **PATENT REVERSIBLE DOOR LOCKS**, which by their peculiar construction, combine **SIMPLICITY, STRENGTH AND DURABILITY**. In these Locks the combination of the Patent Lever and Spring renders the latch movement very easy and prompt in action.

Illustrated catalogues and price lists furnished on application.

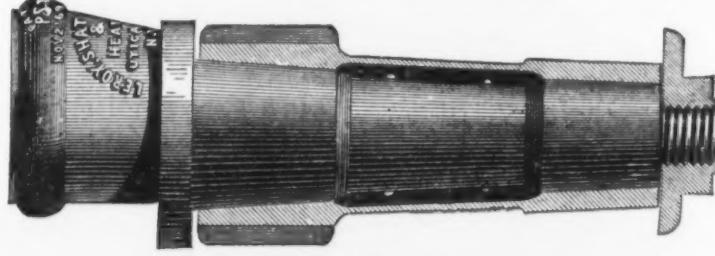
TRENTON LOCK AND HARDWARE CO.,

Manufacturers of Superior Building Hardware.

Trenton, N. J.

AGENTS.

JAMES M. VANCE & CO., 211 Market St., Philadelphia, Pa.; JAMES MARSHALL, 48 Warren St., New York.

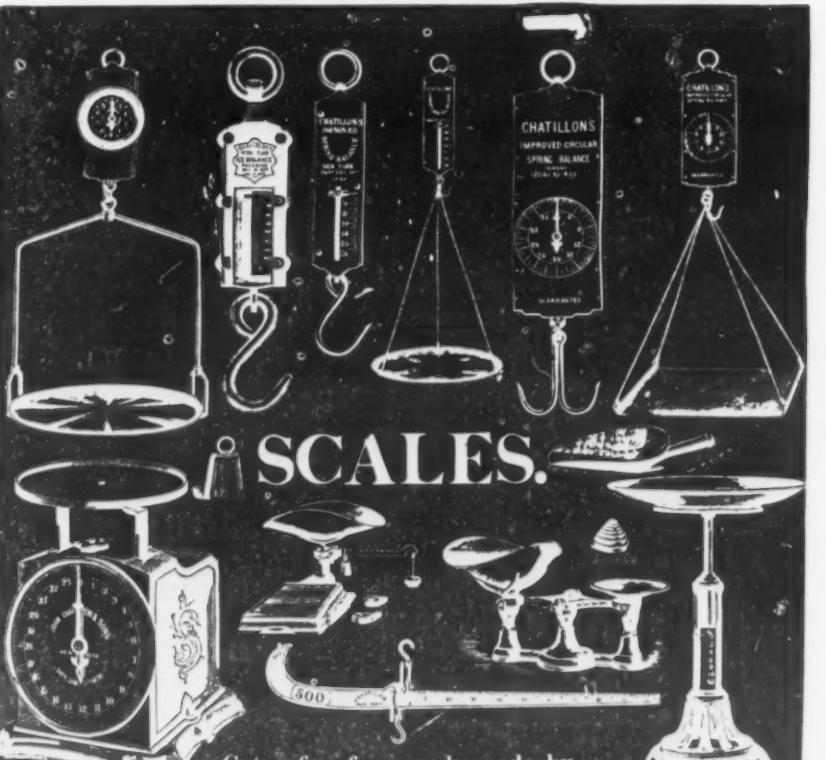
LEROY, SHATTUCK & HEAD,
Manufacturers of
Carriage and Wagon Builders' Hardware,AND
The Celebrated "UTICA" (xx) SKEINS and BOXES.TRADE
P.S.T. PLUMB SPOKE TAPER SKEINS AND BOXES.
MARK
42 sizes Common Skeins and Boxes. 21 sizes Double Extra Skeins and Boxes.
22 " Seamed " 22 " Brass Bearing "
20 " Ex. Heavy " 22 " Babbitt Bearing "
18 sizes Old Taper Skeins and Boxes.

IVES' PATENT BURGLAR PROOF DOOR BOLT.

Can be applied

wholly by
boring.
Sure protection
against burglars
or tramps.TO THE HARDWARE TRADE.—I invite the attention of the Hardware trade to my
PATENT DOOR BOLT. Important features in this invention are its mode of application, sure
protection and pleasing finish. Put up in boxes, one dozen each, nickel plate and bronze.Agents. GRAHAM & HAINES, 113 Chambers St., New York.
A. T. YOUNG, 36 Pearl street, Boston; LATHAM & MATTHEWS, N. E. cor. Sixth and Commerce
streets, Philadelphia, Pa.; S. H. & E. Y. MOORE, 161 and 165 Lake St., Chicago; GEO. N. GOSLING,
30 Sansome St., San Francisco, Cal. Send for Price List.

HOBART B. IVES, Sole Manufacturer, 187 St. John St., New Haven, Conn.

SCALES.
Cuts of a few goods made by
JOHN CHATILLON & SONS, NEW YORK, U.S.A.

Lake Superior Iron.—The Marquette Mining Journal publishes statistics of Lake Superior iron and ore production, which show that in 1879 there was an increased production as compared with 1878 of 289,089 gross tons, and an increase of 22,179 tons in the shipments of pig metal. The value of these products is given only approximately, on board vessels at port of shipment, care being taken to underestimate rather than to overvalue them. The figures are interesting in that they show the gradual increase of product during a period of 24 years, and of nearly one million of tons as compared with only ten years ago. The output in 1879 was 246,803 tons greater than in 1873, the largest previous year, notwithstanding the fact that two of the largest mines show greatly diminished figures as compared with those of 1873, the reason for which has heretofore been fully explained. Of the output for 1879, 1,145,093 tons came from the mines of Marquette county, and 269,000 tons from the Menominee range—the increase from the first being 118,245, and from the latter 170,844 gross tons. It is yet too early to predict with any degree of accuracy the probable output the present year. It is safe to say, however, that nearly all the mines are in a position to enlarge upon last year's figures; whether they will do so depends altogether upon the demand, to which there at present appears to be no end within the utmost possible limit of production. Should this demand take on a positive form in the shape of contracts for the season's delivery, a product of two million tons in 1880 is not to be considered among the impossibilities.

Special Notices.

SECOND-HAND and NEW TOOLS FOR SALE LOW.

February List No. 1.

Miscellaneous Second-Hand Tools.

All in Good Order, and will be sold very low

Two Engine Lathes, 20 in. swing x 1/2 ft. bed.
Two Engine Lathes, 20 in. swing x 8 ft. bed.
One Engine Lathe, 24 in. swing x 12 ft. bed.
One Engine Lathe, 18 in. swing x 10 ft. bed.
One Engine Lathe, 20 in. swing x 14 ft. bed.
One Engine Lathe, 18 in. swing x 6 ft. bed.
One Engine Lathe, 18 in. swing x 6 ft. bed.
One Engine Lathe, 18 in. swing x 5 1/2 ft. bed.
Seven Engine Lathes, 18 in. swing x 7 1/2 ft. bed.
(Chain-feed Lathes.)

One Horizontal Boring Lathe.

Six Turning Lathes, 14 in. swing x 4 1/2 ft. bed.

Two Wood-turning Lathes.

One Bench Double Pulley Lathe.

One Planer, 24 in. x 5 ft.

One Planer, 27 in. x 7 ft. chuck, &c.

One Planer, 27 in. x 37 in. x 10 ft.

One Planer, 72 in. x 66 in. x 24 ft.

Two Planers, 28 in. x 5 ft.

One Planer, 24 in. x 6 ft.

One 3-ft. Pratt Drill.

One 4-ft. Pratt Drill.

One Four-Spindle Drill.

One Shaping Machine, 12 in. stroke.

Three Bolt Cutters, various sizes.

One No. 2 Bolt Cutter.

One Gear Cutter.

One new "Hardaway" Bolt Heading Machine, to head up to 1/2-in. bolts.

One new "Hardaway" Bolt Heading Machine, to head up to 1/2-in. bolts.

A lot of Saw Tables and Wood Working Machinery.

NEW TOOLS, Very Low.

One Shaping Machine, 14 in. stroke, Wood & Light.

Five No. 2 Bolt Cutters, Wood & Light.

One No. 1 Bolt Cutter, with center, Wood & Light.

Three No. 2 Bolt Cutters, with center, Wood & Light.

One Planer, 32 in. x 8 ft., New Haven.

One Upright Drill, 38 in., New Haven.

Please specify which of the above tools you want and we will forward all particulars.

A Woodruff & Beach Beam Engine,

Low pressure, 48-inch cylinder, 84 inch stroke, with fly-wheel pulley 20 feet diameter, 36 inch face, and

Four Tubular Boilers,
60 inches in diameter, 20 feet long, and all connections practically as good as new.

For sale by

The Geo. Place Machinery Agency,
121 Chambers and 103 Reade St.,
NEW YORK.

For Sale or Lease.

FOUNDRY,
NEW YORK CITY.

The plot of ground (Excelesior Works) measures 275 ft. frontage by 100 feet deep. It has a splendid Foundry, 60x16 feet, with cupolas, cranes, &c. If leased, additional buildings to any extent will be erected to accommodate any kind of manufacturing business. Apply to WM. J. FRYER Jr.

Etna Iron Works, 104 Goerck Street.

ELIZABETHPORT ROLLING MILL,

Elizabethport, N. J.,

**Common and Refined
BAR IRON,**
Fish Plates, Spikes, &c.

Address,

DANIEL W. RICHARDS & CO.,

Importers of and Dealers in Scrap Iron and Metals.

88 to 96 Mangin St., New York.

For Sale,

A ROLLING MILL, located convenient to Pittsburgh, with facilities for river and railroad transportation. The property consists of 88 acres of land, with the necessary buildings, dwellings for workmen, two heating furnaces, eight puddling furnaces, muck train, 16-inch train, 8-inch train, and all the necessary machinery; all in good order, the mill being now in operation. There is a coal shaft on the property, with the privilege of 1/8 acre of coal, and coal is run direct from mouth of shaft to the furnaces.

For further information address

Lock Box 100, Pittsburgh, Pa.

DESIGNS

FURNISHED FOR

Superior Manufacturers' Tools

And Special Appliances.

Improvements made, ideas worked out. Drawings, models, patterns and machines made to order in the best manner.

RICHARDS & DOLE, Springfield, Mass.

Wanted.

To exchange cash and some real estate for a stock of hardware.

ROBERT LUCAS,

Fremont, Ohio.

FOR SALE.

One 10-inch train complete, made by A. Garrison & Co., Pittsburgh, consisting of Roughing, Strand and Guide Rolls, with housings, plowpins, spindles, boxes and crabs.

The train is new and has never been used.

Apply to

CHOUTEAU, HARRISON & VALLE IRON CO.,

No. 914 N. Second St., St. Louis.

FOR SALE.

One valuable Charcoal Furnace Property, Hampshire County, West Virginia, near Baltimore and Ohio R. R., about 800 acres well wooded, large tracts of timber, 500 acres of mineable coal and Bessemer iron. Improvements, one furnace and building, engine, &c., complete. Ready for immediate operation. Five months' charcoal on hand.

Apply to

TITUS S. EMERY, 238 Walnut St., Phila., Pa.

WANTED.—A position by a man of eight years' experience as architect and foundry in a Western city. Understands architecture, drawing and construction, and is familiar with engineering. He is also a bookkeeper. Best references. Address

BOX 292, Montgomery, Ala.

Protection in Canada.

The new tariff stops importation.

Branches of existing U. S. manufacturing companies are accordingly being established in Canada.

A Complete Manufacturer,

with substantial buildings; water power; in good

center for labor and railway distribution; obtained by owners by foreclosure; offered for sale at a bargain; terms easy. Full information application to

DONALD C. RIDOUT,

Toronto, Ontario.

FOR SALE.

Water front property of 20 acres or more, with frontage of two feet for docks, suitable for manufacturing purposes. The tract is crossed by the Lehigh Valley, Central of New Jersey and Pennsylvania Railroads, and fronts on deep water on the line of the Delaware and Raritan Canal towpath at Perth Amboy, N. J. It is within a short distance of the terminus of the Lehigh Canal Railroad on the south at Perth Amboy. Address

WILLIAM T. MEREDITH,

37 William St., New York.

WIRE MANUFACTURER.—A gentleman who

has had several years' experience in the best

mills is desirous of an engagement as Manager.

Small mill preferred. Address "WIRE".

Office of The Iron Age, 83 Reade St., N. Y.

Special Notices.

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One 3-ft. Pratt Drill.

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One Four-Spindle Drill.

One Shaping Machine, 12 in. stroke.

Three Bolt Cutters, various sizes.

One No. 2 Bolt Cutter.

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Low pressure, 48-inch cylinder, 84 inch stroke, with fly-wheel pulley 20 feet diameter, 36 inch face, and

Four Tubular Boilers,
60 inches in diameter, 20 feet long, and all connections practically as good as new.

For sale by

The Geo. Place Machinery Agency,
121 Chambers and 103 Reade St.,
NEW YORK.

For Sale or Lease.

FOUNDRY,
NEW YORK CITY.

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Douglas Patent Auger Handles.....	net
set.....	all large, \$1.28 per
Swan's Patent Augers.....	net
Improved Augers.....	net
Boring Machines.....	15
Spoke Trimmers.....	15
Tap Borex.....	15
with Ring.....	15

The Cowles Hardware Company, Unionville, Conn., have issued the following discount sheet:

Dis. per cent.

Awls, Carpenters' Forged.....	40
" Machinists'.....	40
" Marking.....	35%
" Belt.....	50
Bung Starts.....	25
Butter Spuds.....	25
Boot Jacks, Automatic.....	25
" Tally Ho.....	25
Bill Hooks.....	per doz. net, \$12.00
Bull Bungs Needles.....	25
Bow Pins.....	25
Butts, Double Spring.....	25
" Single.....	25
" Box.....	25
Border Knives.....	25
Box Openers.....	25
" Hooks.....	25
" Scrapers.....	25
Cleavers' Cast Steel.....	25
Cake Turners.....	25
Corn Hoops.....	25 & 10
Cook Utensils.....	25
Cold Chisels.....	25
Cattle Leaders.....	25
Carriage JACKS.....	per doz. net, \$9.00
Carpet Stretchers, Bullard's.....	25
" Common.....	25
Door Spring, Hercules.....	25
Air Cushion.....	25
Door Check.....	25
Egg Beaters.....	25
Fish Turner.....	25
Ferrules, Brass.....	25
Faucets, Rosewood.....	25
Handles.....	25
Hammers, Steak.....	25
Hinged Gate, Double Spring.....	25
Horse Hair Tack.....	25
Hoses, Garden.....	25
Ice Awls, Iron Head.....	25
" Maple Handle.....	25
Ice Tongos.....	25
Lemon Squeezers.....	25
Mousie Traps, Pat. Auto., per doz. holes.....	25
Mallets.....	25
Miners' Case Steel.....	25
" Hammered.....	25
Nails Sets, Black.....	25
Punches, Solid Center.....	25
" Round.....	25
Spoons, Tin, Table and Tea.....	25
Screw Drivers, No. 1.....	25
" No. 2.....	25
" No. 3.....	25
" No. 4.....	25
" Sewing Machine.....	25
" For Lock Spindles.....	25
" Bit Brace.....	25
" Implements, price accord-	25
ing to quantity.....	
Trowels, Garden.....	25
Tack Claws.....	25
Washers, Iron, 8 cents off from list price.....	25
Vegetable Slicers.....	25

ing to quantity.

Trowels, Garden.....

Tack Claws.....

Washers, Iron, 8 cents off from list price.

Vegetable Slicers.....

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only necessary to say that there is a difference of rather more than a dollar between them.

The soft, free-burning Coals are from \$2.75 to \$2.80 for Broken, Egg and Chestnut, and \$3 for Stove. The harder Coals command proportionate prices, while the manufacturing sizes of Lehigh hold at circular rates. The large companies are not selling Coal at the present time. They show considerable concert of action, possibly because they do not wish to begin a war quite so early in the season.

PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St., Philadelphia, Feb. 3, 1880.

Pig Iron.—The market during the week has been very quiet, and although prices are nominally unchanged, the average sales would doubtless show a decline of at least \$1 per ton. The demand is very light, but more equal to the offerings from first hands.

The offerings of foreign Iron and lots held in second hands have been more urgent, however, so that there is an unsettled feeling and a good deal of doubt as to the immediate future of the market.

The general feeling still seems to be in favor of higher prices, and the present inactivity is said to be preliminary to a further advance at an early date.

Notwithstanding the high figures quoted, as compared with prices during the past five years, there seems to be entire confidence in values, and materially lower prices are scarcely thought of, unless as stepping stone to something higher.

As intimated in our last, this feeling, of itself, tends in a large degree to sustain the market, although experienced men express the opinion that there is a solid foundation on which to base present quotations.

The enormous consumption bids fair to continue without abatement during the current year, while the capacity for production has not proved nearly equal to what was predicted some time ago.

The difficulty of securing suitable ores in quantity is said to be another formidable obstacle, and for months to come it is said that production cannot exceed consumption.

If these views are correct (and they are held by the majority), prices will no doubt be sustained, and probably some advance may be realized in course of a few weeks.

There seems to be danger in the large importations of Iron, and unless foreign markets follow our own, there may be trouble from these sources.

There is already a difference of \$5 @ \$8 per ton between the foreign and domestic article, No. 3 being about \$31 for the former and \$39 for the latter, and the best brands of No. 1 Foundry \$37 against \$43.

At the figures quoted for foreign Iron, there is said to be a very liberal margin for the importer, while the fact of its increased consumption indicates that, at a price, it will be taken in preference to the American Iron.

In the meantime consumers are experimenting, but from the increased sales we have reason to believe that it is likely to be a dangerous competitor, if prices of American advance much further.

Since writing the above we find that there is to-day more pressure to sell and prices are decidedly easier, American Iron being quoted for Philadelphia delivery: No. 1 Foundry, \$41 @ \$43; No. 2 Foundry, \$39 @ \$40. Gray Forge about the same price. North of England, \$32 @ \$35, with offerings, to arrive, at \$2 @ \$3 per ton less money.

Blooms.—There is much difficulty in giving anything like correct quotations, but we hear of Anthracite Blooms being held firmly at \$95; Charcoal do., \$105.

Muck Bars.—Business during the week has been very light, owing to the scarcity of stock and the extreme views of holders.

Sales have been made in a small way at \$63 @ \$65, at which figures the market may be considered steady and firm.

Structural Iron.—The demand has been somewhat more active, and sales to a moderate extent have been made at current quotations.

The outlook is good, and manufacturers anticipate a demand equal to their full capacity.

We have not heard of any transactions of special importance, but the mills are running full on orders received from week to week.

Angles are quoted at 4¢; Beams, Channels and Tees at 4¢.

large importations. Still, although the price seems low, there is said to be considerable difficulty in placing orders, manufacturers in England being as unwilling as others are to enter for forward delivery. Then, again, there is difficulty in getting an assortment of sizes, without taking into consideration the question of quality. We have not had many Bars imported into this market, but the steadily advancing price of American Iron compels buyers to look in every direction for supplies at prices which will allow some margin for profit. Skelp Iron is still in demand at full prices, and may be quoted 4.3¢ per grossed to 4.75¢ per sheared.

Steel Rails.—There is no change in any respect, prices being fully maintained, and still tending upward. It is difficult to quote sales, but at the Western mills \$90 has been paid, and \$85 to \$90 may be regarded as extreme limits. Buyers are numerous, but sellers are not offering rails, unless in reply to urgent inquiries from regular buyers.

Steel Blooms.—Sales have been made at prices equal to \$5 @ \$60. Several thousand tons have changed hands during the week, but it is uncertain if they will be shipped to the United States.

Iron Rails.—A considerable amount of business has been done during the week, and we hear of sales reaching nearly 20,000 tons, at prices varying from \$65 to \$75, at mill, according to section of Rail. Fifty-sixes have sold at \$68 @ \$70, twenty-fives at \$75, sixteens at \$80, and are all firmly held at outside quotations. The indications point to a heavy demand during the spring months, and manufacturers are firm and unwilling to enter orders, unless at prices which fully meet their views.

Old Rails.—The demand has been much less active during the week and prices are slightly easier, and probably \$1 per ton lower than a week ago. The offerings have been small, however, and the market would, no doubt, quickly react on a very slight improvement in the demand. In the meantime, \$43, spot, and \$44, to arrive, are about the asking prices, but we have not heard of any transactions of a very recent date. In the absence of sales at lower prices, we quote \$43 @ \$44, but, as before stated, orders could probably be placed at somewhat lower figures.

Scrap Iron.—The market remains without change. Good quality of No. 1 Wrought commands \$40 @ \$42; Cast, \$30 @ \$32. Market steady.

Nails.—Business is somewhat quiet, but stocks are greatly reduced, and prices are firmly maintained at \$5.25, less the usual trade discount.

PITTSBURGH.

Office of The Iron Age, 77 Fourth Avenue, Pittsburgh, Pa., Feb. 3, 1880.

The weather has become quite cold, and it begins to look as if we might have some winter yet. It is not unusual for navigation to be closed this month, but there is this about it, if the river should happen to freeze over it is not likely to remain so very long. A suspension of navigation just now would be a serious drawback to our manufacturers who are interested in cheap transportation, but, on the other hand, there has been no ice put up as yet in this section of the country, and an ice famine is apprehended.

Large shipments of Iron and Nails were made to St. Louis last week, distance about 1200 miles, at 10¢ per cwt., and glassware at 20¢;

this week the rates have been advanced to 15¢ and 25¢. The rates from Wheeling are usually about the same by river as from Pittsburgh, and the shipments of Nails from the former place have been quite large within the past few weeks. The difference in the cost of transportation by rail and river is frequently a fair margin of profit for our manufacturers, and this being the case, it is not strange that they are strongly in favor of river improvement, which, in the South and West, is looking up as one of the most prominent features of the day.

Pig Iron.—There has been a slight lull in the Pig Iron trade the past week, but no signs of weakness have been developed; on the contrary, the feeling obtains among producers that prices will go still higher before the much-talked of and long-looked-for reaction sets in. One reason of the lull, to which reference has been made, is that consumers generally are well supplied; but few of the mills have less than a two months' supply, and others have from four to six months' stock contracted for, and they are not so anxious to buy now as they have been, although some of the commission men report that they could still place orders with us.

Steel.—There has been no change in prices for some weeks, but they are firm, with the mills all very busy. The inquiry does not appear to be confined to any particular grade, but runs throughout the entire list.

Scrap.—There is a fair and increasing business, and prices are still tending upward; Scrap has been slow to advance here as compared with Pig Iron, but that it has gone up materially is evident to all who are familiar with the business. Quotations may be fairly given as follows:

Old Car Wheels, gross \$44 @ \$45
Machinery Metal, " 20 60 30
Cast Borings, " 18 60 20
No. 1 Wrought Scrap, net, 44 60 45
Old Car Axles, " 48 60 50
Old Car Springs, " 42 60 43

Window Glass.—The demand continues to increase, and with very light stocks and manufacturers refusing large orders, prices are still tending upward. The discount has been reduced again, and we now quote at 50% straight on single strength and 50 and 10% on double.

Coke.—There is no abatement in the demand. On the contrary, it continues to increase, and with makers pressed with orders and cost of production increasing, prices continue very firm, although we do not advance our quotations, which now are \$3 @ \$3.50 per ton, delivered on cars at ovens.

Coal.—Nearly all the river miners have resumed work at 3/4¢ per bushel, the operators refusing to pay the advance demanded, and for the time being all is quiet in the Monongahela Valley. The down-river markets are well supplied and prices are easy.

At New Orleans the price of Pittsburgh Coal has been reduced. At Cincinnati, Zanesville and all points along the river prices are lower, and our Coal operators generally would like to see the Ohio River freeze up and remain so for two or three months.

enhanced cost of raw Iron. The advance was not a matter of choice. There was some opposition on the part of Pittsburgh to the advance, on the ground that it was too great, but the Western men, those from Cincinnati in particular, would be satisfied with nothing less, and they carried their point. Cincinnati has a good deal of small trade for which full card rates can be obtained, whereas the business of Pittsburgh is chiefly the very reverse, and, as is well known, it is difficult ordinarily to obtain full card rates for large orders. The advance from 3/4¢ to 4¢ was a radical one, but not extravagant when the enhanced cost of raw Iron is taken into consideration.

Nails.—While there has been no change made in the card as yet, it is almost certain that rates will be advanced materially before long—possibly at the next meeting of the Western Nail Association, which takes place here to-morrow week. There have been number of large orders on the market within the past week, some of them speculative, at full card rates, but manufacturers are refusing to sell, except in a small way to regular customers. Large shipments have been made from Wheeling by river recently, mostly on old contracts, and a good many purchases have been made there within the past year on Pittsburgh account, as the price, until quite recently, was lower than here.

Railway Spikes.—There is no abatement in the demand, nor is there likely to be soon. No change in price—4.25¢, 30 days.

Horse and Mule Shoes.—There is an increasing demand, as there usually is this month, when it is customary with some jobbers to stock up, although the policy of anticipating future wants is not near as common as in former years. Shoenberger & Co. quote their Junta Horse and Mule Shoes in quo-keg lots at \$6 and \$7 per keg, net, 30 days.

Wrought Iron Pipe.—Discount on new list for Gas and Steam Pipe, 35%; the change, as might be expected in the present condition of the Iron market, is an advance. Orders are coming forward freely for the season, and it looks as if the pipe business would be unusually large this year. Boiler Tubes remain unchanged at 5 and 5% discount; Oil-well Casing, 3/4-inch, \$1, net; do. Tubing, 2-inch, 35¢, net.

Rails.—No sales of Steel Rails have been reported here for some time past, and it is difficult to give accurate quotations in consequence; prices continue on the upward move, and it is doubtful whether an order could now be placed under \$90, cash at mill. It is understood that the mill at St. Louis is now asking \$90, deliverable there. Old Iron Rails are quoted at \$47 @ \$48, at which rates they are much cheaper than either Pig Iron or Muck Bar. One of the larger consumers here informs your correspondent that he has 12,000 tons bought, equal to any Muck Bar in Pittsburgh, to cost about \$15 per ton less than Muck.

Muck Bar.—Has gone still higher, in sympathy with Pig Iron, and is now held at \$63 @ \$65, cash at mill, with but little offering.

Steel.—There has been no change in prices for some weeks, but they are firm, with the mills all very busy. The inquiry does not appear to be confined to any particular grade, but runs throughout the entire list.

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At New Orleans the price of Pittsburgh Coal has been reduced. At Cincinnati, Zanesville and all points along the river prices are lower, and our Coal operators generally would like to see the Ohio River freeze up and remain so for two or three months.

REvised Price List.

Merchant Iron.

Teasels.—Note or acceptance at 60 days, with current rate of exchange on New York or a discount of 2% per cent for cash, if remitted within 10 days from date of invoice.

Flat Bar.

1/2 to 1/4 by 3/4 to 1 inch..... 4.00
4 to 6 by 3/4 to 1 inch..... 4.10
1/2 to 6 by 1/2 to 1/4 inch..... 4.40
1/2 to 1/4 by 3/4 to 1/2 inch..... 4.10
1/2 to 1/4 by 1/2 to 1/4 inch..... 4.20
1/2 to 1/4 by 1/2 to 1/4 inch..... 4.20

Rounds and Squares.

1 to 1 1/2..... 4.00 5¢ to 9-15
2 to 2 1/2..... 4.20 5¢ to 7-15
2 1/2 to 3 1/2..... 4.50 5¢ to 10-15
3 1/2 to 4 1/2..... 4.80 5¢ to 12-15
4 1/2 to 5 1/2..... 5.50 5¢ to 15-18
5 1/2 to 6 1/2..... 6.00 5¢ to 18-20
6 1/2 to 7 1/2..... 6.50 5¢ to 20-22
7 1/2 to 8 1/2..... 7.00 5¢ to 22-25
8 1/2 to 9 1/2..... 7.50 5¢ to 25-28
9 1/2 to 10 1/2..... 8.00 5¢ to 28-30
10 1/2 to 11 1/2..... 8.50 5¢ to 30-32
11 1/2 to 12 1/2..... 9.00 5¢ to 32-35
12 1/2 to 13 1/2..... 9.50 5¢ to 35-38
13 1/2 to 14 1/2..... 10.00 5¢ to 38-40
14 1/2 to 15 1/2..... 10.50 5¢ to 40-42
15 1/2 to 16 1/2..... 11.00 5¢ to 42-45
16 1/2 to 17 1/2..... 11.50 5¢ to 45-48
17 1/2 to 18 1/2..... 12.00 5¢ to 48-50
18 1/2 to 19 1/2..... 12.50 5¢ to 50-52
19 1/2 to 20 1/2..... 13.00 5¢ to 52-55
20 1/2 to 21 1/2..... 13.50 5¢ to 55-58
21 1/2 to 22 1/2..... 14.00 5¢ to 58-60
22 1/2 to 23 1/2..... 14.50 5¢ to 60-62
23 1/2 to 24 1/2..... 15.00 5¢ to 62-65
24 1/2 to 25 1/2..... 15.50 5¢ to 65-68
25 1/2 to 26 1/2..... 16.00 5¢ to 68-70
26 1/2 to 27 1/2..... 16.50 5¢ to 70-72
27 1/2 to 28 1/2..... 17.00 5¢ to 72-75
28 1/2 to 29 1/2..... 17.50 5¢ to 75-78
29 1/2 to 30 1/2..... 18.00 5¢ to 78-80
30 1/2 to 31 1/2..... 18.50 5¢ to 80-82
31 1/2 to 32 1/2..... 19.00 5¢ to 82-85
32 1/2 to 33 1/2..... 19.50 5¢ to 85-88
33 1/2 to 34 1/2..... 20.00 5¢ to 88-90
34 1/2 to 35 1/2..... 20.50 5¢ to 90-92
35 1/2 to 36 1/2..... 21.00 5¢ to 92-95
36 1/2 to 37 1/2..... 21.50 5¢ to 95-98
37 1/2 to 38 1/2..... 22.00 5¢ to 98-100
38 1/2 to 39 1/2..... 22.50 5¢ to 100-102
39 1/2 to 40 1/2..... 23.00 5¢ to 102-105
40 1/2 to 41 1/2..... 23.50 5¢ to 105-108
41 1/2 to 42 1/2..... 24.00 5¢ to 108-110
42 1/2 to 43 1/2..... 24.50 5¢ to 110-112
43 1/2 to 44 1/2..... 25.00 5¢ to 112-115
44 1/2 to 45 1/2..... 25.50 5¢ to 115-118
45 1/2 to 46 1/2..... 26.00 5¢ to 118-120
46 1/2 to 47 1/2..... 26.50 5¢ to 120-122
47 1/2 to 48 1/2..... 27.00 5¢ to 122-125
48 1/2 to 49 1/2..... 27.50 5¢ to 125-128
49 1/2 to 50 1/2..... 28.00 5¢ to 128-130
50 1/2 to 51 1/2..... 28.50 5¢ to 13

the order of the day, and we have our share of the excitement. While naturally elated at Louisville's prominence in the various moves, we are not vain enough to imagine that our city is to be coddled at the expense of other communities reached by the L. & N. R. R. Hostility to foreign capital, evinced already in efforts to compromise or repudiate the State debt, is also showing itself in inflammatory utterances at public meetings and through the press against the L. & N. in view of its late acquisitions. Such sentiments cannot but work harm to Southern industries of all kinds, and so deserve more than passing notice, while they are deplored. We congratulate ourselves that a more intimate connection with Chattanooga is assured, as that neighborhood is daily growing in importance. We want more capital for the South's development, and we must protect it carefully that it may come in abundance and come to stay.

RICHMOND.

Mr. ASA SNYDER, Iron Merchant and Furnace Agent, writes as follows under date of February 2: Pig Iron quiet. Old Rails and Wrought Scrap very active; sales of about 600 tons Old Rails the past week. Market for all descriptions quoted below firm.

Scotch Pig Iron	35.00 @ .00
American Scotch Pig Iron	39.00 @ .03
No. 1	39.00 @ .03
" No. 2	38.00 @ .12
" No. 3	37.00 @ .39
Mottled and White	35.00 @ .37
Cold-blast Charcoal	35.00 @ .37
Warm-blast Charcoal	35.00 @ .37
Old Rail	34.00 @ .44
Wrought Scrap	34.00 @ .44
Cast Scrap Machinery	30.00 @ .25
Richmond Refined Bar Iron, Stand'd.	3.00 @ .00
Horse Shoes, Tredegar	3.00 @ .00
Mule	3.00 @ .00
Old Dominion Nails, (standard size)	5.15 @ .55
according to size of lots.	
Freights to New York, \$2.00 for 2,000 lbs. by sail.	

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(From our Regular Correspondent.)
LONDON, ENGL., Jan. 19, 1880.

THE IRON TRADE,

although not satisfactory in every respect, is in many particulars very strong, and on the whole may be said to maintain its position on the advanced lines which came into operation in the first week of the year; and so far as I am in a position to ascertain, there are few or no signs of an immediate relapse. There are, without doubt, certain symptoms at Glasgow and in Cleveland which are not by any means healthy or satisfactory, but the speculation which is prevalent in the North is to a great extent a known quantity, and is consequently of less danger than it might be under other conditions. The speculators of Glasgow are certainly plunging about rather wildly on warrants, and their operations have been largely responsible for the notable rise which has taken place in makers' brands. The latest intelligence from your side will probably enhance the intensity of the existing fever, but it is commonly anticipated that there will be an inevitable relapse before long, when a number of the dabblers will be bitten. Should the inflation attain any very considerable dimensions beyond the point already reached, the crash will be all the more severe, and may send back makers' quotations in proportion. The legitimate market, however, outside and apart from the bubble-blowing in crude irons, seems to stand its ground very firmly, and those who are, in all probability, best able to judge are of the opinion that we are absolutely certain of a much better year than we experienced in 1879, with many probabilities in favor of a great and early consumptive spurt, accompanied by proportionately higher selling rates. This view is held by many exceedingly experienced iron men, and appears to me to be as near the mark as it is possible to reach. At the same time, there are those who hold the opposite theory, and one of them, over the signature of "Iron," has expressed himself in the *Times* as being convinced that the whole of the seeming prosperity in our leading metallurgical industries is a sham, a vast and hollow mockery, which is destined to burst up almost immediately and bring ruinous consequences upon all concerned. This gentleman touches upon several of the points which favor his view of the case, especially insisting upon the smallness of the American demand and the amazing inflation which he says pervades your market. I do not, of course, presume to follow this writer through the details of his gloomy calculations, or to waste my space in attempting to refute his arguments; but I may as well say at once that I entirely dissent from his conclusions. It may be, of course, that I am better informed as to the actual course of the iron and steel trades, or that my temperament is just now on the sanguine side; but so far as my information goes, I can perceive abundant tokens of prosperity and very few of an early backwardness. I have, on former occasions, told you that I believe prices to have been run up too rapidly in certain branches, and I have taken occasion in prior communications to run over the various data which then seemed to me to favor a policy of extreme caution; but since those letters were penned there have been many changes in an upward direction, and I have now little hesitation in stating that I believe our comparative security, on a broad and active basis, is already assured for the first half of 1880. This may seem a rather strong statement, but I have fair reasons for the inference, with every disposition to view the question from a pessimistic rather than from an optimistic standpoint. I might go even further and say that with a continuance of the really amazing "boom" in the United States we shall witness a state of affairs which few can now confidently predict, and none would be willing to admit they really anticipate. There may possibly be partial stoppages in the flow of the flood tide now and then, as has invariably been the case on previous similar occasions, but these will probably not prove lasting, unless circumstances become prominent which are at

present wholly unforeseen and hidden. Any impartial and unbiased observer of that which is going on throughout our ironmaking districts must needs be astonished at the activity and hopefulness which now prevail, but he will be none the less convinced of the reality of the change, and of its numerous indications of life and vigor. The current reports from all parts of the country are replete with items particularizing preparations for increased production; inability to meet the demand for certain sorts of materials, raw and finished; and the receipt of orders, large and small. So long as the spurt was wholly confined to crude descriptions, few persons were inclined to hope for or expect the wider progress of the upward movement, but at the present time when many of the producers of rails, ship plates, bars, sheets, hoops, &c., are actually unable to undertake commissions for near-and in some instances relatively distant-future deliveries, there are but few who remain unbelievers. The situation necessarily has certain elements of weakness and possible confusion, but the weight of our present evidence lies in the opposite direction, and I, personally, strongly incline to the belief that we are on the eve of a period of very considerable activity and prosperity. The possible causes of a relapse are, in brief: 1. The presence of speculation in raw materials and pig iron. 2. The large stocks of pig iron in Scotland and in Cleveland. 3. The comparative poverty of the home market. 4. The danger of abnormal inflation in the United States and 5. The risk of prices being unnaturally forced up to too high a level. The first of these reasons I should not be disposed to treat too lightly, but I think it will rectify itself. The second is largely counterpoised by the fact that not only Great Britain but the Continent have been almost wholly depleted of scrap and other old materials. The third is serious, but may work round in due course with a fine summer. Of number four you are better able to speak than myself, but I take it that we need not regard the point as being unduly risky. Number five is an imminent danger, if we add to it the extreme probability of production being greatly augmented in this country. Shaken up and averaged, nevertheless, I don't see any solid reason for varying my belief, as already expressed, that we are about safe for the first half of the year, whatever may come about after midsummer. Hitherto we have depended almost wholly upon your progress, but we are all gradually emancipating ourselves from that predicament, and with the growing increase of activity among our cousins and European neighbors we now begin to feel our feet, and are somewhat inclined to boast of the achievement.

THE ELECTRIC LIGHT

controversy, which has gained redoubled intensity in connection with the most recent of Mr. Edison's inventions (as to which we have had a variety of newspaper telegrams) still excites much controversial correspondence here. Many of the experts, including Mr. Preece, of the post office, ridicule the assertions made by or on behalf of Mr. Edison, as to the capabilities of his new paper horse shoe lamps, and assert that no such results as those claimed can be obtained from the low engine power mentioned. They naturally make merry over the latest cablegram, which announces that the philosopher of Menlo Park has had to suspend his operations, owing to some defect in the horse shoes, and predict that the whole thing, from beginning to end, has been worked up as a clever piece of stock exchange manipulation. At the same time, there is a decided impression in the minds of most people that the electric light is certain to become the light of the future, and that it is only a mere question of time as to the period when it will actually be perfected. Here, it is slowly but surely gaining ground, and is having a gradually widening constituency. In the Aldergate Street Railway Station last evening, eight electric lamps filled the place of scores of gas lamps and burned brightly and steadily, as they do every evening. The system used is the Lontin. A great tailoring establishment in Ludgate Hill has just been fitted with 17 lamps on the Jablockhoff principle, and there the report is also favorable, equal light being secured with an entire absence of heat. In Regent street several shops are lighted in the same way, and the Thames Embankment is so illuminated every night. The public decidedly favor the new mode of lighting.

SCOTCH PIG IRON

has been excited during the week, and a good deal of speculation has been in operation at Glasgow. The fluctuations in warrant quotations have been more noticeable than for some time past, amounting to 2/ and 3/ in one day, which is a far wider range than that which ordinarily prevails. It is probable that our most recent news from the States will again send up the market during the present week, although shipments are by no means heavy, and the production, as well as the reserve stock, is increasing. The particulars furnished by John E. Swan & Bros. show that there are 104 furnaces in blast in Scotland, as compared with 91 this date last year, and the stock in Connal's stores 428,485 tons, against 204,162 tons a year ago. Of the furnaces blowing, 47 are old style and 57 gas. Ballast pig has gone up to 55/- per ton, alongside ship, and freights to New York are 15/- the latter fact having a decided tendency to check speculative shipments. Writing on January 17, James Watson & Co. said: "The Scotch iron market has been very sensitive and irregular during the week, with a considerable amount of business done. On Monday the opening figure was 72/3, advancing to 73/-, receding to 72 1/4, and closing at 73 1/4 £1 ton. On Tuesday the market receded from 73 1/4 @ 70/6, cash, a good business being done. On Wednesday the price was erratic, opening at 70/6 it declined to 69/9, then improved steadily to 72 1/4 cash. Yesterday a reaction set in, and the market declined from 72/9 @ 70/9, cash, while to-day it opened at 70/6, declined to 70/7, then improved to 71/3, finally closing at 70 1/2 £1 ton. There has been a fair demand for No. 1 shipping brands, but No. 3 foundry iron is not in such demand." The ship-

ments last week were 6689 tons, as compared with 6669 tons for the corresponding week of 1879. We quote:

	No. 1.	No. 3.
G. M. B., at Glasgow	75/-	69/6
Galloway	87/6	74/
Coltness	90/-	75/-
Summerlee	90/-	75/-
Langloan	86/-	75/-
Carnbroe	86/-	75/-
Calder, at Port Dundas	86/-	75/-
Glengarnock, at Ardrossan	86/-	75/-
Eglinton	80/-	70/-
Dalmellington	80/-	70/-
Shotts at Leith	86/-	75/-

Last week £10,375 of pig went to New York, and £1041 to Boston, U. S.

IN CLEVELAND

There is great and apparently increasing activity in all parts of the district, the demand for several kinds of finished iron, and especially for ship plates, being more than equal to the producing powers of the mills engaged in that branch. There are 97 furnaces in blast in the district and about 270,000 tons in stock, yet prices are firmly maintained, and vendors have apparently little or no inclination to book forward deliveries save at 5/- @ 10/- more money. Present quotations for pig, G. M. B., are:

No. 1. Foundry	No. 4. Forge	63/-
2	65/-	Mottled.
3	65/-	White.
4	65/-	Kondledge.

All net cash, delivered f. o. b. at makers wharves in the Tees.

In the course of the next month or so about 12 large furnaces and 100 puddling furnaces will be added to the productive capacities of the North of England.

THE BESSEMER AND RAIL TRADES

being just now of unusual importance, both on this and your side of the Atlantic, it may perhaps be of advantage to endeavor to arrive at something like an approximate estimate of their producing powers, in respect both of ingots and finished rails. There are about 120 Bessemer converters in Great Britain, the largest being the two 10-ton ones of John Brown & Co., of Sheffield (who have six in all), down to several of 1 ton to 10 cwt. in different places. In tabular form these are classed as under:

No. of Works.	Capacity.	No. of converters.	Tons. Cwt.
Henry Bessemer & Co., Ltd.	2	3	3
Bedford	1	2	5
Brockow, Vaughan & Co.	4	4	8
Linton, and Middleborough	1	2	10
John Brown & Co., Limited	4	7	10
Sheffield	2	10	10
Brown, Bayley & Dixon, Sheffield	4	8	8
Chas. Cammel & Co., Limited, Sheffield	2	5	5
Wearside Iron Company	2	7	7
Tudhoe	4	2	10
Steel Company of Scotland, Glasgow	8	3	3
Samuel Fox & Co., West Sheffield	3	5	5
Lloyd's Foster & Co., Wednesbury	4	3	3
Bonckow Iron and Steel Company, Bolton	4	6	6
L. & N. W. Railway Company, Crowne	2	3	3
M. S. & L. Railway Company, Gorton	2	3	10
Mersey Steel and Iron Company, Liverpool	10	5	5
Mersey Steel and Iron Company, Manchester	4	3	3
Barrow Steel Co., Barrow	12	6	6
Dowlais Company, Dowlais	2	7	6
Ebbw Vale Company, Ebbw Vale	2	5	5
West Cumberland Iron and Steel Co., Workington	2	8	8
Steel, Tozer & Hampton, Limited, Sheffield	2	6	6
Carnforth Hematite Iron Company, Limited	2	6	6
Preston Shaft and Axletree Company, Wednesbury	4	3	3
Moss Bay Hematite Iron & Steel Co., Workington	2	7	7
Rhymney Iron Company	2	8	8
Wilson & Cammel, Ironfield	6 (?)	8 (?)	8 (?)

Out of these the following only have rail mills: 1. Bonckow, Vaughan & Co.; 2. John Brown & Co.; 3. Brown, Bayley & Dixon; 4. Charles Cammel & Co.; 5. Glasgow Company; 6. Samuel Fox & Co.; 7. London and Northwestern Railway Company; 8. M. S. & L. Railway Co.; 9. Mersey Steel Company; 10. Barrow Company; 11. Dowlais; 12. Ebbw Vale; 13. West Cumberland Company; 14. Steel, Tozer & Co.; 15. Moss Bay Company; 16. Rhymney; 17. Wilson & Cammel. Speaking roughly, and with no precise official data before me, I should be inclined to think the following a pretty fair estimate of the average separate and aggregate annual output of these mills:

	Tons weekly.	Tons yearly.
Bonckow, Vaughan & Co. (see below).	8,000	210,000
Brown, Bayley & Dixon	1,800	80,000
Charles Cammel & Co.	1,500	70,000
Glasgow Company	500	30,000
Samuel Fox & Co.	500	20,000
Mersey Steel and Iron Company (see below).	700	25,000
Bonckow	2,000	100,000
Dowlais	1,800	80,000
Ebbw Vale	1,400	56,000
West Cumberland Company	500	20,000
Steel, Tozer & Hampton	1,300	50,000
Moss Bay	600	25,000
Rhymney	700	30,000
Wilson & Cammel	1,500	70,000

Total estimate for year..... 735,000

This statement is, of course, affected by the circumstance that John Brown & Co.

PATENT DECISION.

Hardware dealers will please take notice of the decree of Judge Lowell, of the United States Circuit Court, in the case of Millers Falls Company against Quimby S. Backus, for infringement of Bit Brace Patents, which decree was in favor of the Millers Falls Company. The full text of the opinion may be found on page II of *The Iron Age*, of date December 18, 1879.

We have now obtained three separate decrees against three different manufacturers, and shall continue to prosecute all infringers. When the manufacturers are able to pay the damages we shall in no case trouble dealers, but when manufacturers are unable to pay we must ask the dealers to remunerate us, else responsible dealers might combine with irresponsible makers to render worthless the most valuable patents. Any reasonable man can see the point, and we have before given all dealers sufficient notice.

MILLERS FALLS CO.,
74 Chambers street, New York.

TIN PLATES

We make it our special aim to import

MAKERS' BRANDS ONLY.

We invite comparison of our prices with those of other houses quoting WELL KNOWN BRANDS, and feel assured that we can from our large assortment of selected brands, bought at low prices, fill all orders promptly and satisfactorily.

All goods guaranteed as represented.

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Manufacturer of the

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Brighton and
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Absolute Safety!
Perfect Ease!

Time, Labor and Material saved by using the

NICHOLS ACID PUMPS,
to draw all kinds of acids from carboys. Every pump warranted. Send for new circular and price list. Manufactured only by

Acid Pump & Siphon Co

New London,
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The Old Way.



The New.

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MANUFACTURERS OF

Horse, Mule & Snow Shoes of the Perkins Pattern.

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Horse Nail Co.
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FINISHED
[BRIGHT OR BLUED]**



These nails are made of the best brands of NORWAY IRON, and are guaranteed to be equal to any in the market.

**NATIONAL HORSE NAIL CO.,
VERGENNES, VT.
DURRIE & McCARTY, Agents,
No. 97 Chambers St., New York**

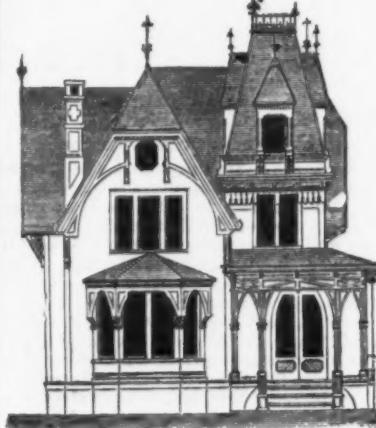
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**THOMAS W. SPARKS,
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BUTCHERS' MACHINES.**
Choppers, Hand and Power
Stuffers, Lard Presses.
Warranted thoroughly made
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**R. C. PURVIS,
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GENUINE IMPROVED
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Wide Bar Full Length.
Wide Bar Full Length.

Patent Screw Wrenches

UNDER PATENTS DATED

JUNE 26, 1866,
MARCH 23, 1869,
REISSUED JUNE 1, 1869,
IMPROVED AUG. 1, 1877.

NOVEMBER 10, 1863,
FEBRUARY 23, 1864,
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MEAT CUTTER

The only Cutter up-on the Market which is required the entire year for family purposes.

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This is the only Cutter ever put on this market that entirely fills the requirements of a Family Meat Cutter. Mincer and Chopper. Being very compact, one pound of meat can be cut as readily as a larger quantity, (which is not the case with other Cutters), while it will cut sausage a good heavy white metal spout is affixed. (See cut). They come complete with clamp so they can be clamped on a table or taken off at pleasure. The outside is nicely japanned and edges painted. The inside covered with "White French Enamel," so they can be easily and nicely cleaned as well as making them attractive machines. There is no other Meat Cutter upon the market that will take the place of Meat Choppers sold for this express purpose but cost three times the money. A trial solicited.

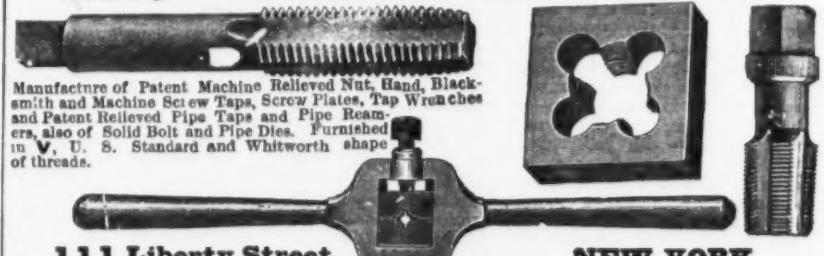
No. 00 Improved Pennsylvania Meat Cutter, Price, per doz., \$28. Discount 40 & 10%.

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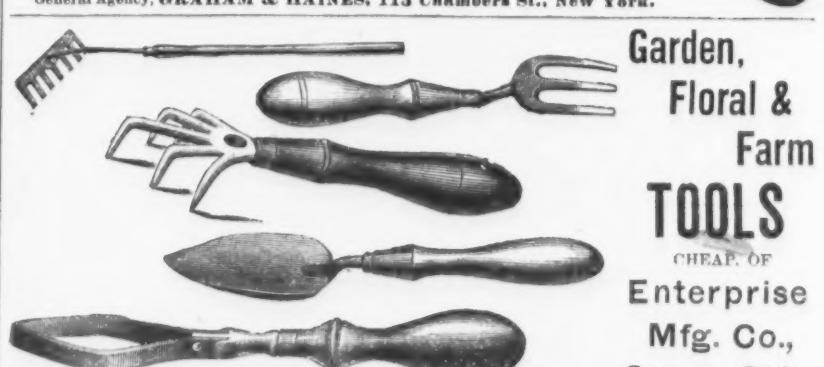
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We warrant these Faucets to be as represented, measuring correctly and working more easily in heavy molasses than any Measuring Faucet in the market. No grocer can afford to be without one. "Time is money." They insure perfect cleanliness, requiring no tin measures or funnel to collect dirt and dust flies. They do not waste oil, water, or any fluid. They do not waste or other fluid can pass except when the crank is turned. They are the embodiment of simplicity, and consequently they are always in perfect order, and will last for the longest molasses. They are warranted to measure correctly, according to U. S. Standard.

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Carriage, Tire, Machine, Plow, Stove and Spring Bolts, Coach and Bed Screws, &c.

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Standard Sizes in Cylindrical Fitting.

Mr. George Richards, who is prominently connected with the manufacture of standard gauges, just commenced in this country, has read before the Franklin Institute a paper on the use of standard gauges in cylindrical fitting, from which we take the following:

It seems now to be generally conceded that standard gauges are no longer to be regarded as a luxury, but an essential part of an equipment for manufacturing machines. Their low price, together with the advantage gained by their use, being more generally understood, will account for this. Until recently attention has been diverted to the means of establishing sizes and testing the accuracy of finished parts, but since a source of trouble has arisen in many cases where it was assumed that the possession of standard gauges alone accomplished the desired results, some further means of maintaining the size seems to be called for.

Every one at all acquainted with shop manipulation is fully aware of the fact that before much can be accomplished in the right direction, the holes in the various parts of machines must be finished with some degree of uniformity, to permit of gauges and proper mandrels being used to advantage. Having been obliged from circumstances to base most of the precedents in this manufacture upon the English system of work, in which standard gauges have for many years been very generally employed, the fact was partly overlooked that in their practice holes were bored to size, while here reaming tools were almost universally adopted. To explain the cause of the difficulties which necessarily arose where reamers of the usual type and gauges were used together, attention is called to an example of such a reamer. It consists of a piece of hardened steel with cutting edges about one-half its length, while the other is of cylindrical form (called generally the "shank"), serving in most cases as an extension or handle to reach through deep holes. The cutting edges are ground to finish a hole to standard size when the implement is new. It is no doubt intended that the shank shall be a guide for the cutting edges, after they are fully entered in the hole being reamed, but it will be readily understood that the cutting edges being continually subject to wear, to make a commercial success of such a reamer the shank must be small enough to pass through the hole made by it, without reference to the amount of wear that may occur from continued use.

From this it will be seen that such an implement, without any means of maintaining its original size, can have no reference to standard sizes, except when first used. As the holes made in this way gradually diminish in size, the gauges will not enter the holes, the diameter of cylindrical pieces must also be reduced, and proper mandrels of steel cannot well be employed. The results will, in most cases, be a worse confusion than if no system were attempted at all. It is of course suggested that such reamers be annealed, reset, hardened and ground; as special skill is required for these operations, they rarely receive such treatment, but as many here can testify, are instead reduced to another size.

For these reasons, it has become necessary to supplement the standard gauges with some implement to produce holes to uniform sizes, and the manufacture of an adjustable reamer of the type at present employed in some of our leading shops, has, therefore, been entered upon. The reamer consists of a steel body with inserted blades, upon which the cutting edges are formed. The grooves in which the blades are fixed are not parallel with the center, but at such an angle, that the blades being forced towards the shank, the diameter of the outside of the cutting edges is increased. Such reamers have from time to time been made, with the usual appliances at their command, by those shops where a system of uniform sizes has been adopted, and have no doubt formed the principal means of maintaining such a system after being begun.

The feature of adjusting the size of a reamer as it wears, brings an entirely new set of conditions to bear on the matter (when compared with the solid ones). It permits of an uniform difference being constantly maintained between the diameter of the cutting edges and the shank. In this case the shank can be utilized as a means of guiding the cutting edges, to insure straight holes being formed, and still further form a means of determining the wear to be permitted, as it becomes a check to the use of the reamer when it requires readjustment. Inasmuch as different grades of fitting will allow of more or less variation in the holes, this limit of accuracy, as it may be called, can be regulated with some degree of certainty.

This form of reamer has always been considered difficult to make, owing to the nature of the fits, but with a view of reducing their cost, to allow of their being generally used instead of the solid reamers, it was necessary to base their manufacture upon milling the dovetail slots uniform in size, and producing the blades without reference to their final disposition in any one reamer. The blades are fitted to drive tightly, so as not to be altered in position by any rough usage they may be subjected to. The blades being interchangeable, they can be renewed when worn to the limits of end adjustment. The plan holding the blade by tight fitting has an object, in preventing the size of the reamer being tampered with by unprincipled workmen, and to insure that it is altered only when worn sufficient to require readjustment. Messrs. Wm. Sellers & Co. have adopted a very good plan in their reamers for this purpose. The blades are driven out from the shank to expand the size. The blades are then ground "flush" with the ends of stock, showing at a glance if the blades occupy their proper position. This plan, however, presents some difficulties in the manufacture of the reamers that overbalances this advantage; any convenient method of adjusting the blades would thus seem a detriment. It might be explained, that in perfecting mechanism to insure this interchange of parts, an equal number, if not more, difficulties have been encountered than in the making of the gauges. The work is required to be uniform to about the

one five-thousandth part of an inch, which is comparatively a much closer degree of accuracy, where results are based on the maintenance of cutting tools, than in the gauges, where the sizes are obtained by grinding and many tests are made.

In beginning the making of cutting tools to be used in finishing working parts of machines, a step was taken outside the province of gauge making, which had only been directed to furnishing standards to make work to, leaving it to the discretion of the user to determine how the finished parts should fit with the gauges. There had always been some misgivings about this matter, from noticing results after standard gauges were employed, and upon further inquiry, quite a difference of opinion was found to exist.

The question is what relation shall the size of holes in machines bear to standard measurements; or, in other words, shall holes be made above, exactly to, or below standard sizes? In order to cause the argument to be more readily followed in entering into details, it will be proper to call attention first to the conditions that must exist in any practical attempt to produce parts exactly similar. Different classes of manufactured products call for more or less uniformity in their parts, the controlling element in most cases being the destruction of the cutting edges, coupled with slight inaccuracies in the working details of the mechanism actuating the tools. There is a defined limit to this matter of making parts duplicate and interchangeable in machines, based upon conditions so numerous that no attempt will be made to point them out here. Even when satisfactory results are arrived at the sizes of duplicate parts can at best be only an approximation to some arbitrary or standard size, but should at all times be within some defined limits, the degree of accuracy established for the work being an exponent of this. This variation then represents the change which tools may be permitted to undergo and yet remain in use for a specific purpose.

It is a matter of much importance to arrive at some very definite conclusions about the relation that the sizes in machine fitting should bear to standard sizes. It has been pointed out that, with proper appliances for making the holes, they become the basis in carrying out a system of uniform sizes. Should the implements for finishing the holes be adjusted at first with an allowance made for their wear to make the holes larger or exactly to a standard size hole?

The difference in the two cases is more than would at first be imagined, and in actual practice is of sufficient moment to warrant the assertion that, even with similar standards in each shop throughout the country, there cannot be said to exist any uniformity in the sizes of their finished product. The difference in the results will at all times be double the limit of accuracy that is assumed in fitting.

The nature of the surfaces on a pin and ring gauge permit of their both being very nearly the same size. One ten-thousandth of an inch difference in either would make a marked change in the fit. Inasmuch as the close fitting of gauges cannot be carried into practice, either the internal or external gauge must be assumed as a shop standard. Everything pertaining to the duplications of standards requires that the external gauge, or a length standard, be assumed as a basis. The standard lengths of Great Britain, adopted by our government, are bare with points, the outside dimension being the standard length. In reproducing duplicates, measuring points are brought in contact with the ends, and the distance between them assumes the form of a gauge for that purpose, but not of a standard length. Referring now to the interchange of different forms of standard gauges, the length standards are represented by pin gauges, the corrective gauge disks and the "heel," as it is generally called, of the fixed caliper gauge, while outside measures for transmitting these lengths are represented by the measuring machine, the ring gauge and the fixed calipers. The latter implements indicate a standard size plus two contacts, or in the case of the ring, of a continuous contact. The amount of surface contact becomes of much moment in the fitting of standard gauges, owing to the nature of the surfaces and the density of the material employed.

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The distance measured between the points of a fixed caliper gauge is less than the internal diameter of a ring gauge indicating a similar size, because of the small amount of surface in contact in the former. Again, the internal diameter of a cast-iron ring gauge must be greater than one of hardened steel, each appearing to fit the same over a cylindrical gauge. This difference is even more when both are fitted to a pin gauge of cast iron. From these few examples it will be understood that the duplication of gauges is based upon assuming outside dimensions as the standard. For these reasons it has been thought best to recommend that in fitting the size of the holes should be above standard sizes enough to show a contact with a standard size shaft similar to the apparent fit of the gauges with one another. To refer again to the variations in duplicating parts, as representing only an approximation at best, the different degrees of fitting must now be brought to bear on the matter. Even if holes are assumed to be made uniform, the size of cylindrical parts must be varied to produce the different contacts referred to in the gauges.

In practice, fits are divided generally into three kinds: first, a driving or forced fit; second, a close contact or exact fit; and third, a fit loose enough to permit of the surfaces being lubricated by the ordinary means. To now bring the three conditions that have been explained together: the standard gauges in their various forms; the variation that must occur from wear of tools to form holes, and the different grades of fits employed in practice, it would appear that to suit these conditions most favorably, the slight variation permissible in the holes, compared with a standard size shaft, should represent the fit described as a close one—neither a loose nor forced fit. Compared with the gauges now, this fit would show a similar contact with them, the fixed caliper going easily over the shaft, and the "heel" of the gauge entering the hole apparently with a similar contact of the shaft. If the fit were

a forced one, the shaft would be larger than the gauge, and if a loose fit, smaller than the gauge. Provided the cylindrical parts of machines were prepared in this manner, without reference to the holes, the variations that must be made in their size to fill the conditions of the different fits is so much more than the variation that should be permitted in the holes, that practically no difference would be noted, whether the size of the hole is at one extreme or the other. To again call attention to the adjustable reamer, as perhaps affording further explanation, the shanks of the reamers are duplicates of standard cylindrical gauges, while the extreme diameter of the cutting edges is the standard size plus the variation or limit of accuracy assumed in the work. The shank at once assumes a new condition as a part of the reamer. It can be considered as a guide to insure straight holes, but its most important function is as a check, to limit the use of the reamer when it has diminished from its original size to the smallest diameter that is permitted from the degree of variation assumed in the fitting. Practically, this forms the only safe means of controlling the sizes in a shop, without continued attention on the part of the manager. Without such an implement, the conditions of fitting referred to would be impossible, and standard gauges could be utilized only to a limited extent in fitting.

Mandrels should receive some attention as having a bearing on the matter. When properly used, they should be divided into two classes, for long or short holes; in one case being made straight about one-half their length, with a taper on the remaining part, in the other with a gradual taper from end to end. One end of them will in either case be to standard size, as the holes cannot be made too small to prevent their being

entered.

SCIENTIFIC AND TECHNICAL.

We have had occasion to refer in previous issues of *The Iron Age* to the efforts made by M. Camille Vincent to create a market for chloride of methyl, by teaching its value for certain applications in the arts. His latest attempt is to introduce the use of

CHLORIDE OF METHYL FOR EXTRACTING ESSENTIAL OILS.

The process is based upon the property of that substance to dissolve fats, resins and essential oils. The first experiments succeeded so far as the extraction went, but the product obtained had a disagreeable odor, caused by the presence in the commercial chloride of methyl of traces of some impurity. This impurity he succeeded in eliminating by treating gaseous chloride of methyl with concentrated sulphuric acid. He extracts the perfume from flowers in the following way: They are digested for two minutes with successive charges of chloride, repeating the operation a number of times. Finally, the digesting vessels are exhausted, and the chloride, which carries with it the volatile essential oils, is obtained in a gaseous state. This mixture is condensed, and the resulting liquid is heated to 86° F. in a vessel from which the chloride of methyl is exhausted by means of a vacuum pump. The chloride is thus separated from the perfume, which is contaminated by fatty and resinous matter. The latter is extracted by means of alcohol.

Herr J. J. Hess, of Vienna, claims to have developed a good method for

COATING METAL GOODS WITH BRASS.

by electricity. He states that the greatest trouble experienced hitherto in accomplishing this has been to obtain a bath which has the power of dissolving both copper and zinc well, so that alloys of the two may be dissolved and deposited uniformly. With former solutions too strong a current would yield a grayish deposit of zinc, and too weak a current would give pale reddish color, while in the most favorable case a poor yellow was obtained. He prepares his solution in the following way: Dissolve 84 parts, by weight, of bicarbonate of soda, 54 parts of chloride of ammonium and 13 parts of cyanide of potassium in 2000 parts, by weight, of water. Then cover the sides of the vessel containing the bath with sheet brass, cast, not rolled, and suspend a sheet in the bath, the former acting as anode and the latter as cathode. After allowing the current to pass through for an hour, the bath will be prepared for any objects to be coated with the same alloy.

Herr Krupp, of Essen, Germany, has recently patented in Germany a method of

WELDING TUBES AND TIRES.

which is based upon the observation that chloride of mercury is very easily reduced to insoluble chloride in sunlight whenever it is mixed with organic substances. The sensitive solution he uses consists of two volumes of a solution of 40 grams of oxalate of ammonia in one liter of water, and one volume of a solution of 50 grams of sublimate in one liter of water. In sunlight turbidity is immediately produced, the action of the light being weaker as the solution is more dilute. Herr Eden has furnished tables for the corrections necessary to allow for the influence of increasing dilution and varying temperature on the quantity of the chloride of mercury separated by the photo-chemical process of decomposition.

Col. Scott's New Project.—The proposition of the Pennsylvania Railroad Company to lease the Louisville and Nashville combined lines, reported recently, has been rejected by President Standiford and Vice-President Newcomb, on the part of the latter company. Mr. Standiford said recently that the proposition was not a new one. It was made once before, some months ago, and was then declined for reasons similar to those which influenced its rejection now. The stockholders of the Louisville and Nashville Company would never consent to such an arrangement, and it would not be for their interest to do so. Negotiations of a modified sort are, however, now in progress, looking toward the joint control of the Louisville, Cincinnati and Lexington Line, between Cincinnati and Louisville, which would give the Pennsylvania Company a direct connection with the lines of the Louisville and Nashville Company, and thus accomplish the proposed combination of interests in another way, although both companies would continue to be entirely independent of each other so far as their management is concerned. The story put forward on the street that the Louisville and Nashville people intend to include the South Carolina Railroad in their combination is officially denied. This road is in the hands of a receiver, and it would require, besides, the building of 160 miles of additional line over the mountains to make the necessary connections.

The *Moniteur Industriel* describes

A CHEAP FIRE ALARM.

which has been invented by M. Brasseur, who claims for it the advantage of being capable of working both when a fire spreads rapidly and when it makes headway very slowly. The apparatus consists of two tubes made of sheet zinc, both covered on the outside with lampblack. They are attached, in a vertical position, to a cast-iron bed-plate, their upper ends being separated by a copper plate which, as a rule, is kept at a certain distance from a contact screw. This screw is connected with one pole of an electric battery, while the copper rod is connected with the other, an alarm bell being in the circuit. One of the two tubes is empty, while the other is filled with tallow and is closed with sealing wax. As soon as a sudden increase of temperature takes place the empty tube will be heated more rapidly than the other, and in expanding will bend and bring the copper rod into con-

tact with the screw, causing the bell to ring. But if the fire spreads slowly, the heat will expand both tubes simultaneously, until the temperature of melting tallow is reached. The tallow in the tube will become liquid, and therefore keep the latter from expanding as quickly as the empty tube, which in this case also begins to bend, and thus also rings the alarm.

Dr. Woodbury is the inventor of a simple and effective method of producing

PHOSPHORESCENT PHOTOGRAPHS.

He exposes a plate coated with a mixture of dextrine, honey and bichromate of potash under a negative, the result being that those portions which are exposed to the effect of the light through the transparent portions of the negative harden, while those which are protected from the light remain adhesive. The lines of the image, therefore, will retain any fine powder which is dusted over it, while the lead portions will not retain it. Dr. Woodbury uses as a phosphorescent powder, sulphite of lime, which, adhering to the unchanged portions of the film, will produce a picture that can hardly be distinguished in daylight from an ordinary photograph, because the substance used is almost entirely white. In the dark, however, having been exposed to sunlight or any strong artificial light, a luminous picture will be produced which is said to be very striking.

Mr. Barnard S. Proctor, of Newcastle, England, in a letter to *Engineering*, claims for Mr. J. S. Swan the priority of invention

of the use of

PAPER CARBONS FOR ELECTRIC LAMPS.

He says that many years since Mr. Swan prepared carbon from paper, having ignited it in a potter's kiln. The carbons he produced at that time were gray, with something of plumbeous luster, sonorous and with sufficient elasticity to bear slight flexure. By passing the electric current through one of these under an exhausted receiver he obtained a beautiful electric light for a short time, the breakdown of the carbon being the result of an imperfect vacuum. Mr. Swan expressed his conviction that this method would ultimately become the most practical mode of obtaining a steady and useful electric light. A year or two ago he resumed experiments in this direction, the chief difficulty to be overcome being the removal of the troublesome atmosphere of the lamp. His improved Sprengel pump (Swan and Stearn's) and other means which he has taken to improve the vacuum, now promise to yield a light of satisfactory permanence as well as of great steadiness and beauty.

According to a recent German patent, taken out by M. Dronier,

MALLEABLE BRONZE.

may be obtained by the addition of a small quantity—from $\frac{1}{2}$ to 2 per cent.—of mercury. The action of the mercury seems to be rather mechanical than chemical, and it is not necessary that the mercury be mixed with the composition of the alloy. It may be added to either of the metals of which the alloy is to consist (being poured into the fused metal and stirred with it); or it can be introduced along with the tin, or soon after it, into the copper bath. Especially good results are obtained if a warm mixture of tin, with 1 to 2 per cent. of mercury, be formed and added to the melted copper.

Herr Eden, in a communication to the Vienna Academy of Sciences, gives the details of

A NEW CHEMICAL PHOTOMETER.

which is based upon the observation that chloride of mercury is very easily reduced to insoluble chloride in sunlight whenever it is mixed with organic substances. The sensitive solution he uses consists of two volumes of a solution of 40 grams of oxalate of ammonia in one liter of water, and one volume of a solution of 50 grams of sublimate in one liter of water. In sunlight turbidity is immediately produced, the action of the light being weaker as the solution is more dilute. Herr Eden has furnished tables for the corrections necessary to allow for the influence of increasing dilution and varying temperature on the quantity of the chloride of mercury separated by the photo-chemical process of decomposition.

A strike of about 100 molders employed at the Reading Hardware Works took place January 29. The cause assigned by the men is that, for some time past, the firm have been running but one cupola for blasting purposes, which caused the molders to work until seven o'clock every evening, whereas by running two cupolas the men claim they could finish the same amount of work by 5.30. The men applied to have this done, but their demands were not complied with, and as a result they quit work in body. Another complaint by the men is that, under the present arrangement, they were compelled to carry the iron used for molding a long distance. Only a short time since this same firm were subjected to a strike from their men on account of wages, which only ended after the molders had carried their point. The trouble has terminated by the proprietors granting the demand of the molders. They will resume work to-morrow morning.

The molders employed at the stove works of Orr, Painter & Co., Reading, have struck for higher wages.

The stove and machine molders of Pittsburgh, to the number of over 1000, are on a strike for an advance. The few remaining at work are non-union men, with the exception of those employed by two firms which have acceded to the demand. The machine molders demand an advance of 10 per cent., and the stove molders ask a return to the old card rates. The machine foundries are extremely busy at this time, while the busy season with the stove manufacturers is about over. These molders belong to the same union, one of the first established in this city.

The Mount Hickory Furnace, at Sharpsville, Pa., has been put upon a mixture of anthracite coal and coke, and it is reported that the working of the furnace has been fully up to the standard. In view of the great favor with which coke is regarded at anthracite furnaces, and the increased consumption of coke at these furnaces, this is a little out of the ordinary course. The cause is the threatened strike of the block coal miners in the Shenango Valley. These furnaces have been run on a mixture of block coal and coke, and anthracite has been substituted for block.

sure from above and from the sides. It is believed that the workmen can proceed faster than by the old method, and that the work can be sooner completed than was at first anticipated. The brickwork will be begun next week.

LABOR AND WAGES.

The railroad miners at Pittsburgh have withdrawn their absurd scale, based on the price of boiling iron, but have adopted the following:

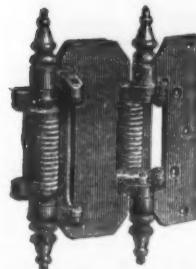
Whereas, The River Convention of last Saturday deemed it inexpedient to strike for 4 cents; and,

Whereas, The river coal is continuing to fill railroad contracts by fully supplying the mills and factories of Pittsburgh; be it

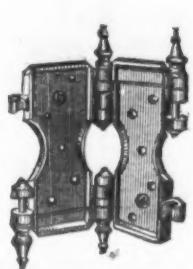
Resolved, 1st, That this convention consider it useless to continue the strike for the present scale; 2d, that the general secretary be ordered to modify his scale

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DOUBLE ACTING BUTT.



DOUBLE ACTING BLANK.

Exert their greatest force when door is closed.

Air Cushion Door Springs, Bullard's Patent Carpet Stretchers, Jewett's Patent Spring Gate Hinges, Cast Steel Mincing Knives, Hammered, Tack Hammers and Claws, Forged Cast Steel Screw Drivers, all varieties, Garden and Ice Tools, Carpenters' Awls, Cleavers, Cake Turners, Box Scrapers, Wagon Jacks.

THE COWLES HARDWARE COMPANY,

Unionville, Conn., U. S. A.

Manufacturers of Household Hardware and Geer's Double and Single Acting Spring Butts, Reverse in Principle.

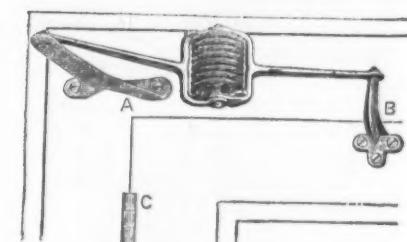
Read the following Points of Superiority:

1. They give, by actual test, 90 per cent. more power at closing point than at right angle, and the pressure is withdrawn 50 per cent. in swinging the door from closing point 14 inches, and grows gradually less till a point past the right angle is reached, where the action of the spring ceases altogether and the door remains at rest.
2. From this point the spring works equally well in either direction, and if the door is opened backward it is firmly retained against the wall.
3. It is impossible to strain the spring, as there is not more than 40 per cent. of its elasticity used in swinging the door back to the wall; therefore it never becomes weak from constant use.
4. Between the bearing joints are placed hardened steel washers, which are much superior to common cast iron or brass, both in regard to friction and durability.
5. They will not allow the door to sag.
6. No rights or lefts. Spring power adapted for either summer or winter without change. Are the only Spring Butts that will by actual test perform the labor claimed for them.

BLANK BUTTS.

We are pleased to offer in addition to our line a Blank Butt, designed to be used in combination with our Spring Butts on inside doors of Dwelling Houses, Hotels, Restaurants or in any position where the doors are not subject to strong currents of air. With our New Blank Butts we furnish for inside doors the most effective as well as the cheapest Spring Butt in market.

Send for descriptive circular, with price lists and Testimonials. Mention this paper.



HERCULES

Reverse Action Door Spring & Retainer.

New principle, distinct from all others. Holds the door open as well as shut. Exerts its greatest force at the closing point. The best Spring in market.

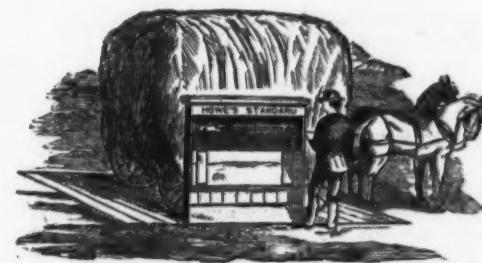
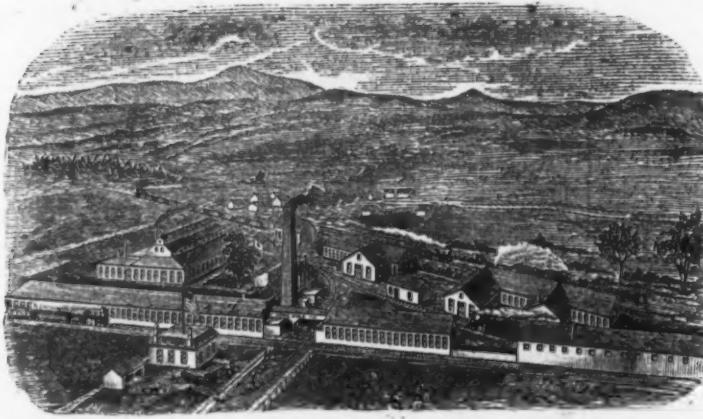
THE IMPROVED HOWE SCALES.

Made in Every



Variety

and Adapted to any



Standard.

The highest Awards have invariably been given the Improved Howe Scales wherever exhibited in competition with other makes.

OFFICES:

PAGE, FARGO & CO., 325 Broadway, New York.
PAGE, FARGO & CO., 213 Market Street, Philadelphia.

BORDEN, SELLECK & CO., 97 Lake Street, Chicago.
J. FRED. DENNIS, 8 & 9 Holborn Viaduct, London.



Front View.

THE HORTON CAR WHEEL CHUCK.

This Chuck can be attached to a boring machine table, or lathe, and will hold a car wheel 37 inches in diameter and less. The jaws are made long to fit both tread and flange of car wheels, thus truing them both ways. For general machine work it is very useful, and will hold firmly any work that can be held in a Chuck.

THE E. HORTON & SON CO.,

MANUFACTURERS OF

THE HORTON LATHE CHUCK

Windsor Locks, Conn., U. S. A.



Back View.

THE HORTON CAR WHEEL CHUCK.

This cut represents the Horton Car Wheel Chuck holding a car wheel in proper position for boring, the flange and tread of the wheel assuming a true position on the jaws. For accuracy and ease of operation this Chuck has no equal.

THE HARTFORD MACHINE SCREW CO.,

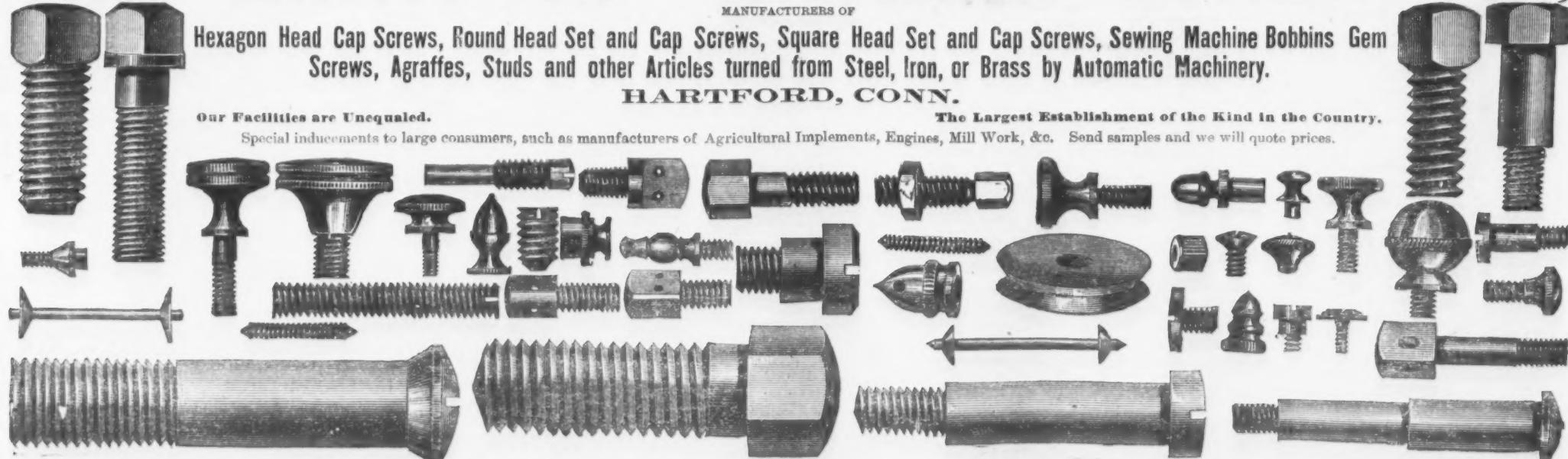
MANUFACTURERS OF

Hexagon Head Cap Screws, Round Head Set and Cap Screws, Square Head Set and Cap Screws, Sewing Machine Bobbins Gem Screws, Agraffes, Studs and other Articles turned from Steel, Iron, or Brass by Automatic Machinery.

HARTFORD, CONN.

Our Facilities are Unequaled.

Special inducements to large consumers, such as manufacturers of Agricultural Implements, Engines, Mill Work, &c. Send samples and we will quote prices.



HENRY DISSTON & SONS

KEYSTONE SAW, TOOL, STEEL and FILE WORKS,



FRONT AND LAUREL STS., Philadelphia.

We desire to call attention to the improvement in putting up our goods, substituting boxes for paper covering. This will prove a great advantage to the dealer, saving the time consumed in untying and tying, also keeping them in better condition.

The new style Box here shown is our latest.

We have been putting up the No. 76 D-8 and No. 120 Saws in boxes containing one-third of a dozen.

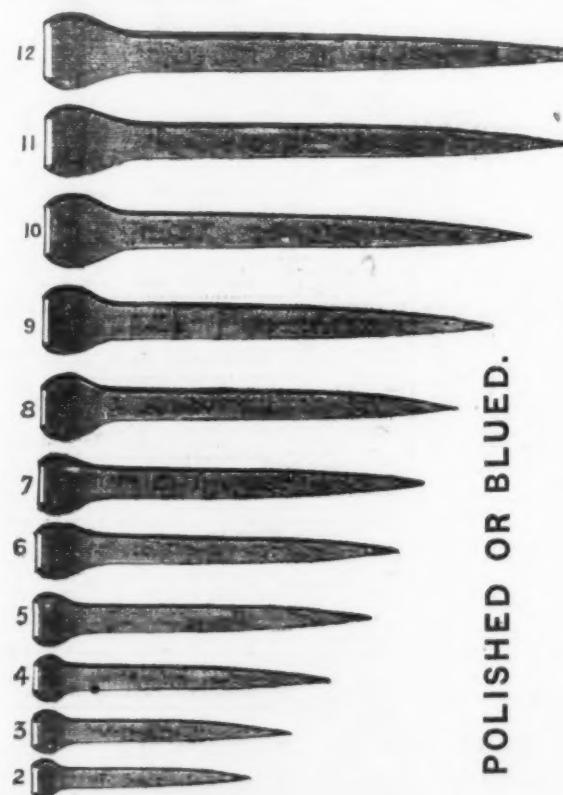


We have decided to put up all the saws marked "Disston" in this manner.

The boxes will contain $\frac{1}{3}$ dozen, and be assorted as follows: $\frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}$, which makes two of each size teeth in a box.

We will send all of the same size teeth in a box, if so ordered.

Henry Disston & Sons.



POLISHED OR BLUED.

AUSABLE HORSE NAILS,

Hot Forged and Cold Hammered Pointed,

Are the only Nails in market that are made in imitation of the Hand Process. They have the uniformity of Machine Nails and the toughness of those hammered by hand. Our

HOT FORGED AND COLD HAMMERED POINTED NAILS

Are the Standard Nails,

and are acknowledged to be the best in the market. They are used by the best shoers in New York, Brooklyn, Philadelphia, Chicago, Saint Louis, Milwaukee, Baltimore, &c., and

GENERALLY THROUGHOUT THE UNITED STATES.

They also compete successfully in Foreign Countries with machine and hand-made Nails of their own manufacture.

AUSABLE HORSE NAIL CO.,

4 Warren St., New York.



A. B. GUNNISON,

MANUFACTURER OF

WOOD PUMPS
ERIE, PA.

ESTABLISHED - 1856.

Warranted Genuine

Cucumber Pumps & Pipe. Also Poplar
Pumps, Lined Pumps, &c.

The Trade Supplied by

H. B. GRIFFING,
60 Courtland St., N. Y.
P. MANN, D. W. DAVIS,
SCOBIE, HARRISON & PAR-
KER, 1st Liberty Street, Pitts-
burgh, Pa.
KNECHT & THOMAS,
Winchester, Ind.

AND BY -
A. B. GUNNISON
Manufacturer,
ERIE, PA.



CLEM & MORSE,
Manufacturers and
dealers in

Steam & Hand-

Power

HOISTING MA-

CHINES,

Dumb Waiters, Base-

ment and Invalid

Elevators,

No. 413 Cherry St.,

PHILADELPHIA, PA.

New York Office,

108 Liberty Street.

All kinds of Hoisting
Machines repaired.

Estimates furnished on

application.

PRESSED STEEL GEARING.
Most powerful, accurate, durable and
cheapest. Any shaped teeth.

J. COMLY, Patentee,
LINCOLN PARK, N. J.

GEORGE W. BRUCE,
1 Platt St., New York,

Agent for CLEMENT & MAYNARD'S Trowels, Hoes,
Screws, Spikes, Sash Snaths, &c. These tools have
entirely supplanted the English by their quality
and cheapness, while all their goods compare advan-
tageously with those of other makers, and are largely
exported.



WM. H. HASKELL & CO.,

Pawtucket, R. I.

MANUFACTURERS OF

COACH SCREWS

(With Gimlet Points),

ALL KINDS OF

Machine and Plow Bolts,

FORGED SET SCREWS,

AND

TAP BOLTS.



Bemis & Call Hardware & Tool Co.

This Wrench
can be fur-
nished with
Bridge, Pat.
Nut or Sleeve.

PATENT COMBINATION WRENCH.

These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, case-hardened throughout, and not only combine all of the superior qualities of our Cylinder and Gas Pipe Wrenches, but also all requisite Combinations of a regular Nut Wrench, thus making a combination which has no equal.

For Circulars and Price List, address

BEMIS & CALL HARDWARE & TOOL CO., Springfield, Mass.

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NO. X.

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NO. 3.

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NO. 6.

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February 5, 1860.

THE IRON AGE.

88

GROOM SHOVEL CO.,

MANUFACTURERS OF SUPERIOR

SHOVELS, SPADES
AND SCOOPS.

SPECIALTIES:

Mining Shovels, Hammered Solid Steel
Railroad Shovels and Spades,
Locomotive & Sand Scoops.

OFFICE,

912 Washington Ave., SAINT LOUIS, MO.

FACTORY,

1031 North Main St., SAINT LOUIS, MO.

COULTER, FLAGLER & CO.,

87 Chambers and 69 Reade Sts., New York,



Hardware
Manufacturers'
Warehouse.



Forsyth's Patent Roller Skate. Patented Feb. 12, 1878.

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For Pipe and Bolts,

Have the following advantages:
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4th.—The Armstrong Dies being made in two parts instead of one (as in the solid Die), can be more perfectly constructed; the cutting edges reached more directly; the work done with greater precision and uniformity, by which they accomplish a much better result.

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**Strong, Clear Grit Stone
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My customers may rely upon being squarely dealt with and getting no poor, unsaleable imitations.

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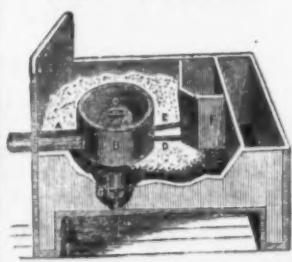
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Pond (Red End).

Beware of Coarse, Brittle Imitations.

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WATER TUYERE Hurricane Bellows "LITTLE GIANT"
AND FORGE.



The side of the tuyere is broken away to show the construction of the TUYERE.

This tuyere can be placed in any Forge, with or without water.

This tuyere has been in use for the past ten years, has stood the test, and exceeds by far any made at the present time.

These tuyeres and forges have obtained for the last three years the medals of special award and superiority and diplomas of maintained superiority at the American Institute Fairs.

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A 30-inch Bellows. No. 4, is equal to a 40-inch pear-shaped Bellows, and a boy of 5 years can work them.

Copy of the Judges' Report in Department V, Group 2, at the 45th Exhibition of the American Institute, October, 1856, No. 661.—Blacksmith's Triple Action Cylindrical Bellows.

John Bayliss, No. 147 East 54th st., New York. That a comparison and an actual test of the above named bellows in competition with the Fan Blowers exhibited in the same group convinces your judges that for Blacksmith's use the bellows not only supply more air than the hand blowers which are at present used to be used for the same purpose, but that it is superior also to bellows heretofore used. We regard it as a decided advance in the art, and unanimously recommend it for the highest award consistent with the rules adopted by your board for such exhibits.

Silver Medal Awarded.

There are three sizes, the cut representing the smallest size.

No. 2 will heat to a welding heat a $\frac{1}{2}$ inch square bar in 12 minutes, and do any work up to $\frac{1}{2}$ inches square iron equal to any forge of larger size.

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Portable Forge and Bellows.

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See Page 3.

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One-eighth page.....	3.15	3.40	3.60	4.10	4.50	5.40	6.25
One-sixteenth page.....	1.75	1.90	2.00	2.25	2.50	3.00	3.50

SPECIAL ISSUES.

In April and October of each year there is published a Special Issue, the circulation of which is not less than **Twelve Thousand (12,000) copies**.

THE IRONMONGERS' DIARY AND TEXT BOOK.

This is an annual, presented free to every subscriber to the *Ironmonger and Metal Trades' Advertiser*. It contains a large number of ruled skeleton pages for diary and other entries, and in addition much useful reference information, varied from year to year. It is handsomely bound in cloth, gilt; and as copies are used in thousands of establishments for a whole year, it is obviously a medium of exceptional value for advertisements. Sold to non-subscribers at 75 cents.

THE FOREIGN SUPPLEMENT

Is published every fourth week in connection with the extensive and world-wide circulation of the *Ironmonger* itself. The dates of its publication in 1879 will be as follows:

JANUARY 11, FEBRUARY 8, MARCH 8, APRIL 5, MAY 3 and 31, JUNE 28, JULY 26, AUGUST 23, SEPTEMBER 20, OCTOBER 18, NOVEMBER 15, DECEMBER 13.

This Supplement is published in

FIVE LEADING COMMERCIAL LANGUAGES

of the world, including English, and is sent to all the countries where they are spoken, thus placing the contents of the *Ironmonger* not only within reach, but in the native language of eighty millions of German, forty-two millions of French, twenty-eight millions of Italian, and fifty-one millions of Spanish speaking people; or, in all, over two hundred millions of inhabitants in the principal nations where the best purchasers of manufactured goods are to be found.

Advertisements are inserted in any language at the following

MODERATE TARIFF.

Size of Page—13½ Inches Deep by 9½ Inches Wide.

	13 INSERTIONS, each net.	7 INSERTIONS, each net.	3 INSERTIONS, each net.		13 INSERTIONS, each net.	7 INSERTIONS, each net.	
One page.....	\$30.00	\$33.75	\$37.50	Gold.	\$10.00	\$11.25	\$12.50
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Advertisers will do well to use illustrations freely. Where economy of space is an object, a left page illustrated and described in one language can be suitably described in four or more languages on the opposite or right page without illustrating.

THE WHOLE FOREIGN HARDWARE TRADE,

so far as our experience of twenty years is concerned, will be covered by THE FOREIGN SUPPLEMENT at least twice a year. Thus a Price List or Advertisement inserted in the *Ironmonger* and FOREIGN SUPPLEMENT is a strikingly powerful and most efficient way of publicity not to be compared with any of the other ordinary channels of communication.

**B. KREISCHER & SONS,
FIRE BRICK.**

BEST AND CHEAPEST.

Established 1845.
Office foot of Houston Street, East River,
NEW YORK.

NEWTON & CO.,

ALBANY, N. Y., Manufacturers of

FIRE BRICK

Stove Linings,

Range and Heater Linings

Cylinder Brick, &c., &c.

M. D. VALENTINE & BRO.

Manufacturers of

FIRE BRICK

And Furnace Blocks
DRAIN PIPE & LAND TILE.

Woodbridge, - - - N. J.

BORGNER & O'BRIEN,

Manufacturers of

FIRE BRICK

AND
Edge Pressed Furnace Blocks,
CLAY RETORTS, TILES, &c.,
Twenty-third Street,
Above Race, PHILADELPHIA.

Twenty years' practical Experience.

PERTH AMBOY TERRA COTTA CO.,

Successors to

A. HALL & SONS, Perth Amboy, N. J.,

ARCHITECTURAL TERRA COTTA

AND

FIRE BRICK.

170 Broadway, NEW YORK.

Brooklyn Clay Retort

AND

FIRE BRICK WORKS.

Manufacturers of Clay Retorts, Fire Bricks, Gas

House and other Tile, Cupola Brick, &c., Dealers in

and Miners of Fire Clay and Fire Sand. Clay bank at

Burt's Creek, New Jersey. Manufactory - Van Dyke,

Elizabeth, Richards and Partition Sts., Brooklyn, N. Y.

Office No. 88 Van Dyke St.

Watson Fire Brick Manufactory

ESTABLISHED 1838.

JOHN R. WATSON, Perth Amboy, New Jersey.

Manufacturer of

FIRE BRICK,

For Rolling Mills, Blast Furnaces, Foundries,

Gas Works, Lime Kilns, Tanneries, Boiler

and Grate Setting, Glass Works, &c.

FIRE CLAY, FIRE SAND, AND KAOLIN FOR SALE.

HENRY MAUER,

Proprietor of the

Excelsior Fire Brick & Clay

Retort Works,

Manufacturers of FIRE BRICK, HOLLOW

BRICK AND CLAY RETORTS.

WORKS PERTH AMBOY, NEW JERSEY

Office & Depot: 418 to 422 East 23d St., N. Y.

TROY FIRE BRICK WORKS

TROY, N. Y.,

JAMES OSTRANDER & SON,

ESTABLISHED 1848.

Manufacturers of

FIRE BRICK,

Tuyeres, Tiles, Blast Furnace Blocks, etc. Miners and

Dealers in Woodbridge Fire Clay and Sand, and Staten

Island Kaolin.

Established 1864.

GARDNER BROTHERS,

MANUFACTURERS OF

STANDARD SAVAGE

Fire Brick, Tile & Furnace Blocks,

OF ALL SHAPES AND SIZES.

Clay Gas Retorts and Retort Settings,

AND

Miners and Shippers of Fire Clay.

OFFICE: 376 Penn Ave., Pittsburgh, Pa.

WORKS: Mt. Savage Junction, Md., and Lockport, Pa.

HALL & SONS,

FIRE BRICK,

Buffalo, N. Y.

MILLER'S BRICK PRESSES

(Established 1844).

FIRE and RED BRICK,

And Brickmakers' Tools in General.

AML. P. MILLER & SON,

309 South 5th St., Philadelphia.

W. & J. TIEBOUT,

Manufacturers of

Brass, Galvanized & Ship

Chandlery Hardware,

No. 290 Pearl Street, New York.

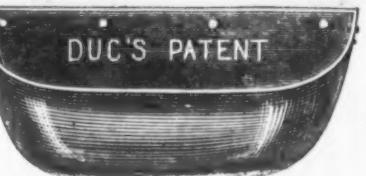
DUC'S IMPROVED ELEVATOR BUCKET.

Made of Best Charcoal Stamping Iron.

No Corners to Catch.

Light Running and Very Durable.

The only Scientifically Constructed Elevator Bucket
in the Market.



THE STORE-HOUSE BUCKET.
(Partial straight front.)
In 12 in., 14 in., 16 in. and 17 in. Sizes.

Send for Circulars.

T. F. ROWLAND,

Sole Manufacturer,

CONTINENTAL WORKS, Brooklyn, E. D., N. Y.

NEW YORK OFFICE, NO. 8 BROAD ST.



THE MILL BUCKET.
In 3 1/4 in. to 10 in.
Sizes.

John T. Lewis & Bros.
No. 231 South Front St.,
PHILADELPHIA.

PURE
WHITE
LEAD.
PHILADA.

TRADE MARK.

MANUFACTURERS OF

Pure White Lead, Red Lead, Litharge,

Orange Mineral, Linseed Oil,

AND PAINTERS' COLORS

Brooklyn White Lead Co.

WHITE LEAD CO. INCORPORATED 1852.
SUPERIOR PURITY, DURABILITY AND COLOR.

ROBERT HOWE, TR.

Office No. 22 Maiden Lane,
NEW YORK.

TRADE MARK.

White Lead, Red Lead & Litharge.

80 Maiden Lane, NEW YORK.

FISHER HOWE, TREASURER.

JOHN JEWETT & SONS

Manufacturers of the well-known brand of

WHITE LEAD.

TRADE MARK.

WHITE LEAD.

ALSO MANUFACTURERS OF

LINSEED OIL.

182 Front Street, NEW YORK.

TRADE MARK.

ATLANTIC WHITE LEAD.

PURE.

ROBERT COLGATE & CO.

287 Pearl Street, New York

TRADE MARK.

The Atlantic White Lead

and Linseed Oil Co.,

MANUFACTURERS OF

White Lead (Atlantic), Red Lead,

Litharge & Linseed Oil.

ROBERT COLGATE & CO.,

287 Pearl Street, New York

TRADE MARK.

DUNBAR BROS.

Manufacturers of

Clock Springs and Small Springs

of every description, from best Cast Steel,

BRISTOL, CONN.

Torrey's Door Springs.

P. R. DUNNE,

Manufacturer,

Bevin Bros. Mfg. Co.,

Easthampton, Ct.

Manufacturers of

SLEIGH BELLS.

House, Tea, Hand,

Gong Belts, &c.

Deli Metal Kettles,

Established 1838.

182 Fulton St.,

NEW YORK.

TRADE MARK.

ORGANS

13 Stoops, 3 set Reeds, Stool, Book,

only \$25. Pianos, Stool, Cover &

Book only \$12.50. Paper free.

D. F. BEATTY, Washington, N. J.

TRADE MARK.

SHOVELS,

PUMPS,

RUDDERS,

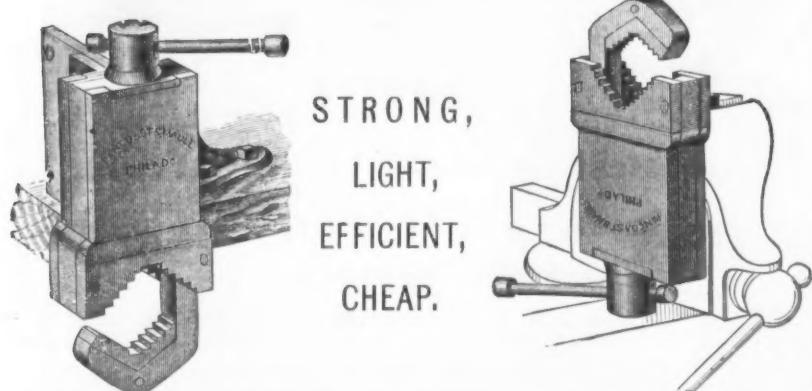
STEEL,

IRON,

PLATE,

SCREW,

IMPROVED PIPE-FITTERS' VISE.



STRONG,
LIGHT,
EFFICIENT,
CHEAP.

To meet the requirements of the large number of persons who have use for such an article, we invite attention to our Improved Pipe Vise. This Vise can be used either as a permanent fixture to work-bench, attached to angle plate or can (unlike others) be held between the jaws of any Machinist's or Blacksmith's Vise; the movable jaw being OPEN ON SIDE permits work to be gripped at any desired point without slipping it from end, and allows of FITTINGS BEING HELD securely; the Box is made of Malleable Iron, the Screw of Wrought Iron, and the remainder of Solid Steel throughout. The Steel Gripping Jaws can be duplicated and replaced at any time when worn out. It is a very convenient tool, well adapted to the wants of Plumbers, Pump Fitters, Well-Drivers, and all who have use for a tool that is strong, light, efficient and cheap which can be readily carried about with kit of tools.

MANUFACTURED BY
PANCOAST & MAULE,
243 and 245 South Third Street, Philadelphia.

Wheeler, Madden & Clemson
MFG. CO.,
MIDDLETOWN, NEW YORK.

Manufacturers of
WARRANTED CAST STEEL

SAWS

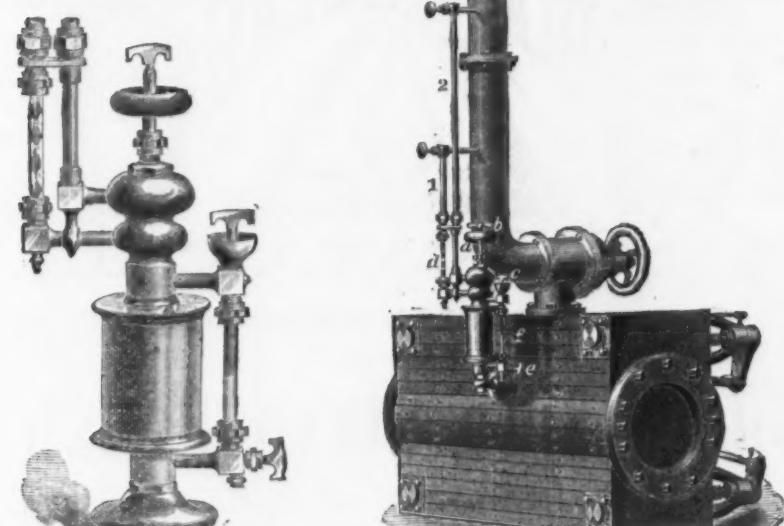
Of every description, including

Circular, Shingle, Cross-Cut, Mill, Hand,
WOOD SAWS, Etc., Etc.

AMERICAN SAW CO.,

Manufacturers of
Movable Tooled Circular Saws,
PERFORATED CROSS-CUT SAWS
And SOLID SAWS of all kinds. Trenton, N. J.

HARPER'S
LUBRICATOR FOR STEAM ENGINES.



This invention is an improvement upon that class of Lubricators in which the lubricating material is floated from the reservoir by the condensed steam passing into the reservoir, and may be applied to all kinds of Steam Engines, by introducing the Lubricator into the steam pipe so that it thoroughly lubricates and prevents the wear of cylinder, piston, valves and rods, thereby saving oil, coal and packing, and adding greatly to the easy working of the Engine. The ultimate saving in repairs to the engine is many times greater than the cost of Lubricator. The glass tube connected with the reservoir indicates the quantity of oil in the reservoir; the upper glass tube the quantity of oil entering the reservoir, and of added oil to the engine can be regulated with certainty. We make great economy of oil; that we leave with the Engineer. This invention is in practical operation, and is very highly recommended by the best engineers, and all now using it. This invention is secured by Letters Patent of the United States, dated Sept. 25, 1871, and April 4, 1877. Information concerning the Lubricator may be obtained from our Agents, or by addressing

THE HARPER STEAM LUBRICATOR CO., Westville, Conn.

CHUCKS.

MANUFACTURED BY
A. F. CUSHMAN,
Hartford, Conn., U. S. A.

Independent 4-Jawed Chucks, from 6 in. to 24 in. in diameter. Common Lever Scroll Chucks, from 3 in. to 24 in. Patent Geared Chucks, from 3 in. to 12 in. Common Geared, from 2 in. to 12 in. A large variety of Chucks for Amateurs' Foot Lathes. Drill Chucks for all kinds of machines and purposes. Patent Geared Chucks for Hollow Spindle Cutting-off Machines. Bench and portable Centering Chucks, and special chucks made to order. Satisfaction guaranteed. All of the above are from new patterns, with every improvement a long experience can suggest. Send for price list.

TURNED
MACHINE SCREWS,
One-sixteenth to five-eights diameter.
Heads and points to sample.
IRON, STEEL and BRASS.
JOHN FELLOWS,

Successor to LYON & FELLOWS, Factory and Office, 18 Dunham Place, Williamsburg, N. Y.



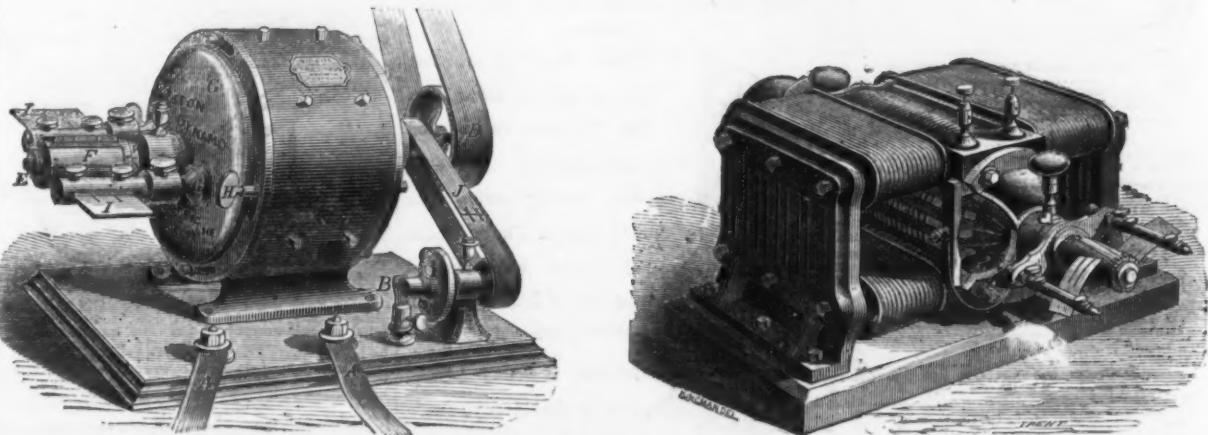
Manufacturers of GALVANIZED PUMP CHAIN FOR CHAIN PUMPS.

WESTON DYNAMO-ELECTRIC MACHINE CO.

286 Washington Street, Newark, N. J., U. S. A.,

MANUFACTURERS OF

Machines for Electric Light, Electrotyping and Electro-Plating.



ARE MAKING

THE MOST POWERFUL, SIMPLE AND COMPACT ELECTRIC LIGHT MACHINE IN THE WORLD.

By actual tests this machine has been found to yield more than double the amount of light per horse-power obtained from the best machines built in this country.

Please send full particulars regarding buildings or localities to be lighted, available power, &c.

Centennial Gold Medal American Institute, 1876. Medal of Superiority, American Institute, 1877.

Centennial Medal, Philadelphia, 1876. Paris Medal, 1878.

TO THE HARDWARE TRADE.

PATENT EXTENSION,

Patented Jan. 29, 1878.



Patented in Great Britain
March 18, 1878.

We desire to call your attention to our NEW

PATENT EXTENSION DOOR KNOBS.

These we manufacture in every variety of style. Your especial attention is called to our "SILVER GLASS," and "ENAMELED" KNOBS, the latter being an entirely new article.

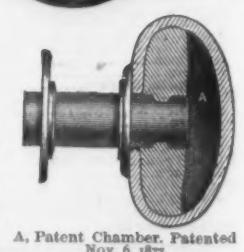
These we offer to the Trade, feeling confident of their superiority to any other door knob in the market. Our new method of extension is simple, durable and perfect.

Our Knobs can be adjusted to doors of any thickness without the annoyance of the old-fashioned washers and pins.

We feel confident that a trial will make plain their merits.

Very truly yours,

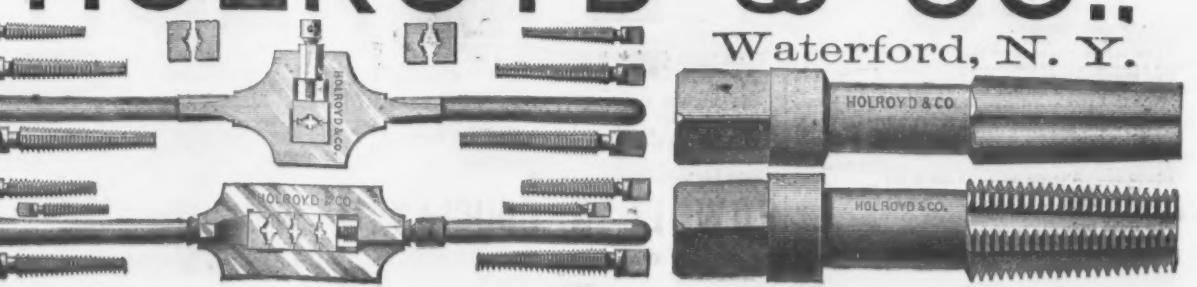
THE STAR SALT CASTER CO.,
BOSTON.



A, Patent Chamber. Patented Nov. 6, 1877.

HOLROYD & CO.

Waterford, N. Y.

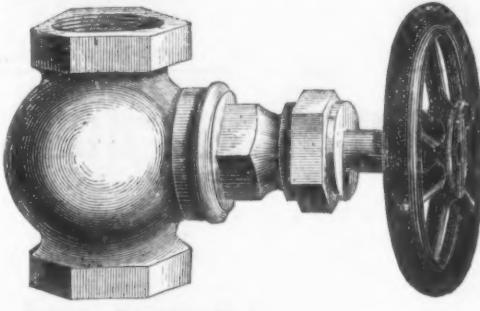


February 29, 1880.

THE IRON AGE.

39

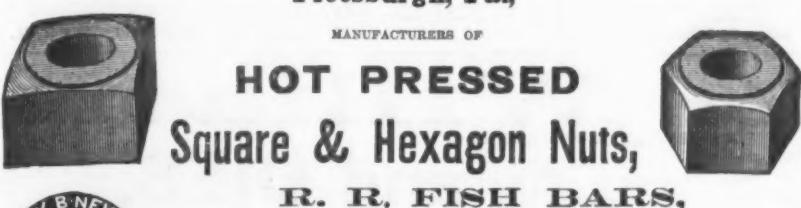
McNab & Harlin Mfg. Co.,
MANUFACTURERS OF
BRASS COCKS AND VALVES,
For STEAM,
WATER
and GAS.
Iron Pipe and Fittings.
PLUMBERS' MATERIALS



New Illustrated Catalogue and Price List sent by express to the Trade on application.

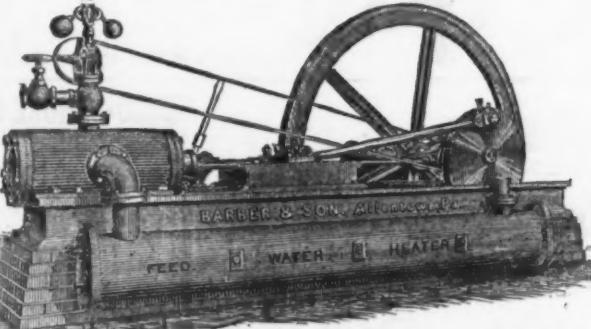
56 John Street, N. Y.

STANDARD NUT CO.,
Pittsburgh, Pa.,
MANUFACTURERS OF
HOT PRESSED
Square & Hexagon Nuts,
R. R. FISH BARS,
BOLTS,
SPIKES,
RIVETS. &c.



HENRY B. NEWHALL
NEW YORK AGENT

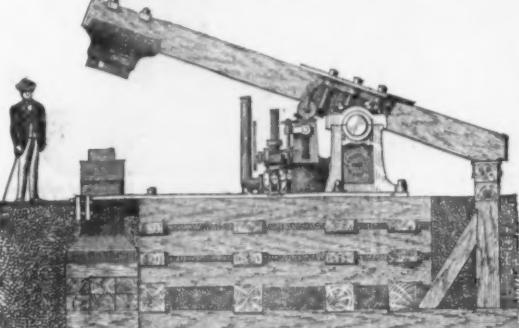
The Allentown Foundry and Machine Shops.
Established in 1835.
Old and reliable. Manufacture Steam Engines, Double Holstering or Reversible Engines, Compound Engines, Boilers of any description, Power Pumps, Flange Pipes from 4 to 36 in. bore, Thomas' patented and Bradford's patent Ore Washers, Mining Machinery, Blast Furnace Work, Hot Blast Castings, Turbine Shafts, Shafting and Pulleys.



More than half of the Engines and Mining Machinery used in mining ores in the Lehigh Iron District were built here. We have more experience in iron ore mining machinery than any other party in Pennsylvania, having most excellent facilities for doing all kinds of engineering work. Our shops are connected by a switch with competing lines in all directions. Parties needing anything in our line will do well to consult us.

W. H. BARBER & BRO., Allentown, Pa.

CUYAHOGA WORKS
MANUFACTURES
STEAM
Hammers
LAND
AND
Marine Engines,
BLAST FURNACE
Machinery.
Send for Circulars.
Cleveland, Ohio, U. S. A.



THE J. MORTON POOLE COMPANY,
Wilmington, Delaware,

Beg to call the attention of manufacturers of Sheet, Hoop and Band Iron to their

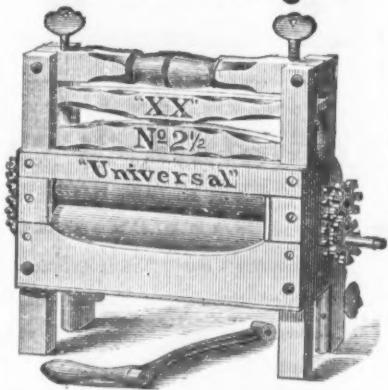
Patent Roll Grinding Machines

for grinding the rolls used in said manufacture. By grinding such rolls, instead of turning, a much greater degree of accuracy is obtained, and as very much less metal is removed from the roll by the grinding operation, the rolls will last much longer. Our Grinding Machines produce perfectly accurate work, and will grind either straight or hollow.

NEW sizes Patent Malleable Iron Oliers, Nos. 2 and 3.
NEW pattern Heavy Screw Clamps; strongest in the market.
Send for Price List.
Malleable Iron Castings of superior quality, and Hardware specialties in Malleable Iron made to order.
HAMMER & CO., Branford, Conn.


Peerless Automatic Damper Regulator.

Superior in every respect to all other Regulators.—Controls steam pressure within one-half of one pound per square inch. Fully opens or closes with less than half the variation of pressure required by any other Regulator. Every Regulator adjustable to any pressure, besides insuring steady power, economy of repairs and safety from explosion. Prefer to have pressure mentioned when ordering. Price, \$35.00. Thirty days' trial allowed before paying. AMERICAN STEAM APPLIANCE CO., 13 and 15 Park Row, New York, Sole Manufacturers, 18 School St., Boston, Mass.

THE "OLD RELIABLE" UNIVERSAL Clothes Wringer.

Improved with Rowell's Double Cog-Wheels on both ends of each roll.

Over 500,000 sold!

And now in use, giving "Universal" satisfaction.

EVERY WRINGER WARRANTED.

Be sure and inquire for the "Universal."

Sold by the Principal Jobbers in Hardware and House-Furnishing Goods everywhere.

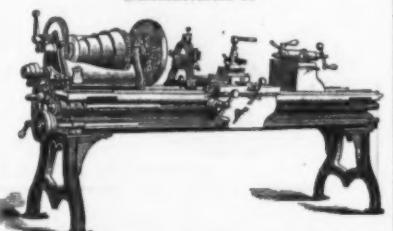
Special rates given for export.

Metropolitan Washing Machine Co.

32 Cortlandt St., New York.

P. BLAISDELL & CO.,

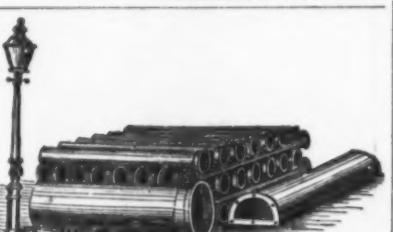
Manufacturers of

**MACHINISTS' TOOLS,**

Blaisdell's Patent Upright Drills, With Quick Return Motion.

Engine Lathes, Planers, Boring Mills, Gear Cutters and Hand Lathes.

WORCESTER, MASS., U. S. A.



R. D. WOOD & CO.
Philadelphia,
Manufacturers of
Cast Iron Pipe
FOR WATER AND GAS.
Lamp Posts, Valves, &c.,
Mathew's Pat. Anti-Freezing Hydrants.
400 CHESTNUT STREET.

STEAM PUMPS,**STEAM ENGINES,****AIR COMPRESSORS,****HOISTING ENGINES.****The Norwalk Iron Works Co.,**

SOUTH NORWALK, CONN.

WM. S. CARR & CO.

Sole Manufacturers of

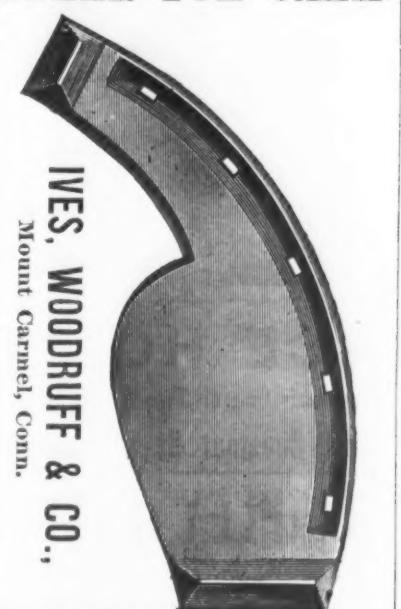
CARR'S PATENT

Water Closets,

PUMPS, CABINET WOOD WORK, &c.

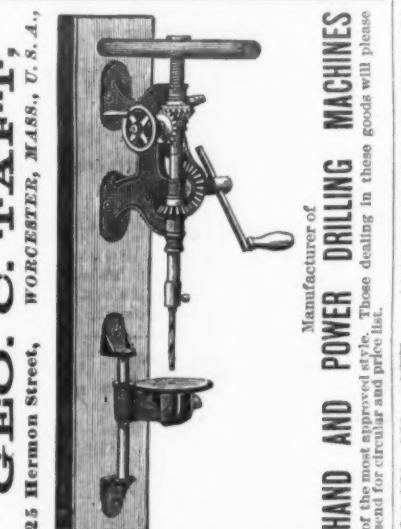
106, 108 & 110 Centre Street,

Factory, Mott Haven, NEW YORK.

STEEL TOE CALK.

IVES, WOODRUFF & CO., Mount Carmel, Conn.

Five Sizes Sharp Calk. Five Sizes Stub Calk. Send for Circular.



Manufacturer of DRILLING MACHINES

of the most approved style. Those dealing in these goods will please

send for Circular.

HAND AND POWER DRILLING MACHINES

of the most approved style. Those dealing in these goods will please

send for Circular.

BOSTON.

Reported by Macomber, Bigelow & Dowse, 156 to

164 Oliver St.

Anvils.—Eagle American V 10 c. per lb.

Apple Parers.—Reading Turn Table V 10 c. per lb.

Goodell Turn Table V 10 c. per lb.

Improved Turn Table & Push-off V 10 c. per lb.

Lightning V 10 c. per lb.

Hudson's Turn Table and Push-off V 10 c. per lb.

Aiken's Tools V 10 c. per lb.

Anvil & Vise V 10 c. per lb.

No. 1, \$4.50; 2, \$7.50; 3, \$10.00 each.

A. L. Hommedieu's Slant Augers V 10 c. per lb.

Jenning's Bits V 10 c. per lb.

Cook's Bits V 10 c. per lb.

Stearns' Hollow V 10 c. per lb.

Sheppard's Double-Cut Bits V 10 c. per lb.

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Stearns' Extension Hollow Augers V 10 c. per lb.

Pierce's Bits V 10 c. per lb.

Griswold V 10 c. per lb.

Axes.—Blue Jackets V 10 c. per lb.

Red Cross V 10 c. per lb.

Dowse's V 10 c. per lb.

A. X. Handles V 10 c. per lb.

Oak Extra, 31 in., No. A V 10 c. per lb.

" " " B V 10 c. per lb.

" " " C V 10 c. per lb.

" " " D V 10 c. per lb.

" " " E V 10 c. per lb.

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" " " W V 10 c. per lb.

" " " X V 10 c. per lb.

" " " Y V 10 c. per lb.

" " " Z V 10 c. per lb.

Axle Clips V 10 c. per lb.

Balances.—Chatillon's V 10 c. per lb.

Bar Door Rail V 10 c. per lb.

Cast Iron for Anti-Friction Hangers V 10 c. per lb.

Half-Round V 10 c. per lb.

Wrought V 10 c. per lb.

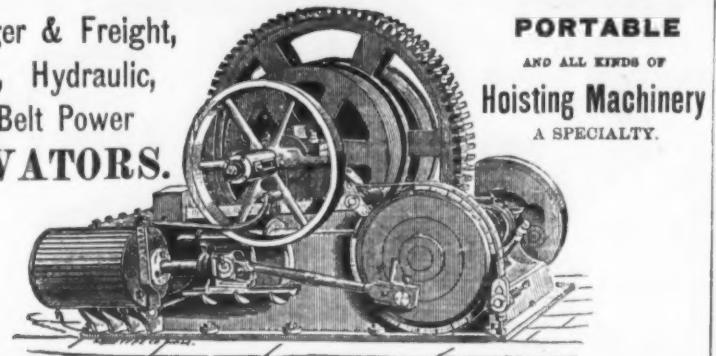
Birch Auger V 10 c. per lb.

Birch's Conical Crank Gage V 10 c. per lb.

Brass V 10 c. per lb.

Brazed V 10 c. per lb.

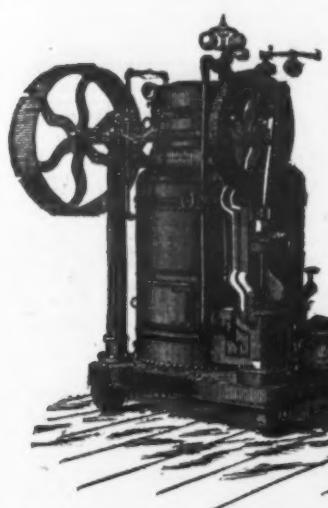
Passenger & Freight,
Steam, Hydraulic,
and Belt Power
ELEVATORS.



IRON FURNACE HOIST,

For Handling Stock to Top of Stack with One or Two Platforms.

STOKES & PARRISH, 3001 Chestnut St., Philadelphia.



SHAPLEY ENGINE.

Patented Feb. 10, 1874.
Reissued June 22, 1875.

Compact, Practical, Durable and Economical.

Acknowledged to be the best in use. This boiler stands unrivaled.

MANUFACTURED BY

SHAPLEY & WELLS,

Binghamton Iron Works,
Binghamton, N. Y.

MANUFACTURERS OF

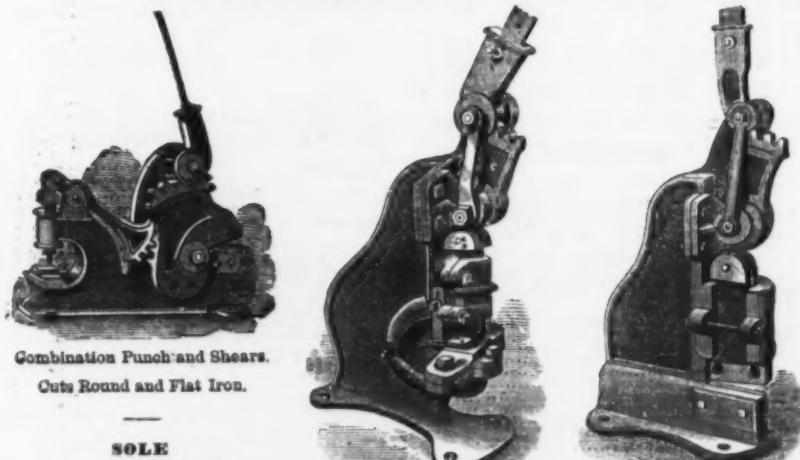
Stationary Engines and Boilers.

Also Machinery for Mills of all kinds and Tanneries. Also their celebrated Bark Mills, acknowledged to be the best.

Send for reduced price list circular.

E. LYON & CO.,

No. 470 Grand Street, New York.



Combination Punch and Shears.
Cuts Round and Flat Iron.

SOLE
MANUFACTURER OF

DRILLS, SHEARS AND PUNCHING PRESSES.

For Workers in Iron and Steel, adapted to all trades.

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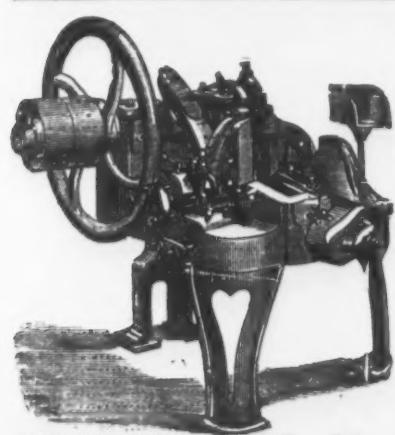
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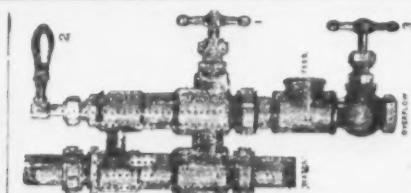
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Manufacturers of Nail and Spike Machines, Bolts, Nuts, Washers, Rivets, &c. Castings, Forgings and Blacksmith Work promptly attended to.

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THE HANCOCK INSPIRATOR,

New Combined Pump and Injector.
Elevates all other appliances hitherto introduced for feeding water to steam engines, &c., not per foot without one. It lifts its water 25 feet with a low steam pressure, and puts it directly into the Boiler. No adjustment necessary for varying steam pressures.

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Is the Standard of Excellence at Home and Abroad.

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OVER 35,000 HORSE-POWER NOW IN USE. ADAPTED FOR ALL PURPOSES.

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No Bolted, Screwed or Packed Joints.

All Joints Made by Expanding Wrought Iron Tubes into Bored Holes.

Can be Erected or Repaired by Ordinary Mechanic.



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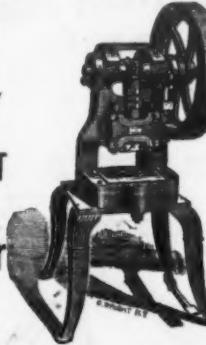
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DEAD-STROKE POWER HAMMERS,
CONSTRUCTION IMPROVED.
Prices Reduced. Seven Sizes.
5 to 250 Pounds.



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Vertical Engines,

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AIR ENGINES. NO WATER.

NO ENGINEER.

No extra insurance! Absolutely safe! Simple! Reliable! Durable!

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Manufacturers of Air Engines, Elevators and Hoisting Machinery

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Proprietors of National Head,

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Nut Machinery, Hot and Cold-Pressed Taps and Dies, &c.

Cleveland, Ohio.

Bolt Pointers, Bolt Headers, Nut Machinery, Hot and Cold-Pressed Taps and Dies, &c.

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Make specialties of

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Punching Presses, Hand Drilling Machines, Ratchet Drills, Combination Lathe Chucks, Cutters for Teeth of Gear Wheels, Screw Plates, Hand, Machine, Nut and Pipe Taps, Bolt Cutters, &c., &c.

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Blake's Patent Expired—End of Monopoly. The undersigned, sole owners of the old Leviathan, Gates' patent, and the Brown's patent Rock Breakers, will guarantee our crushers to break two tons to one of Blake's (or any other). Send for circulars. Also Stamp Mills and all kinds of Mining Machinery made on short notice.

Office, 59 Canal Street, Chicago, Ill.

GATES & SCOVILL IRON WORKS.

Shafting, Pulleys,

Hangers, etc.,

a specialty. Send for Price List to

A. & F. BROWN,

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February 5, 1860.

THE IRON AGE.

41

Machinery, &c.

THE JUDSON GOVERNOR.

It is a common method to advertise Governors *without cost*, unless they are made of cast iron, and then charge *High Prices* for what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the money, becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Regulator of Steam Engines, but also the most durable Governor made. Parties in buying other Governors will stipulate that their durability be guaranteed, and should also take care that they do not, for much inferior Governors, pay higher prices than those shown in the accompanying list. We guarantee the Judson Governor will do all any other Governor can do, and in accuracy and durability—the main essentials—we guarantee it shall do more.

Reduced Price List,
OCTOBER 15, 1878.

For dimensions of Governor, see Illustrated Price List.



Improved Steam Governor.

No Charge for Boxing or Cartage.

JUNIUS JUDSON & SON, Rochester, N.Y.

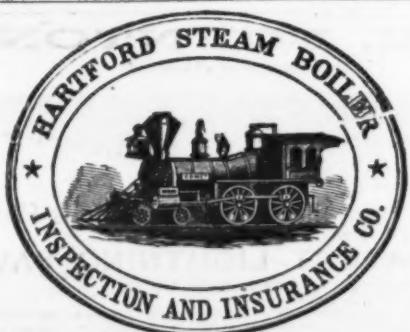
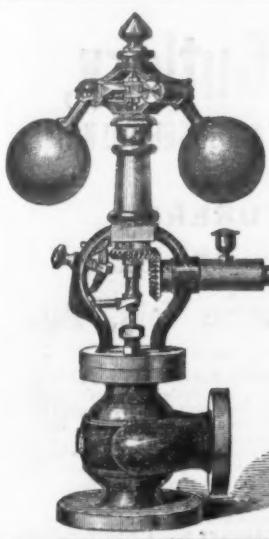
THE SHIVE STEAM ENGINE GOVERNOR.

Reduced Price List, Nov. 1, 1879.

Size of Governor	Black.	Fin- ished.	EXTRA FOR		
			Ball and Lever.	Auto- matic Safety Check.	Stop Valve.
1/8 in.	\$16.00	\$18.00	\$1.00	\$2.25	\$4.00
1	18.00	20.00	2.00	2.35	5.00
1 1/8	20.00	23.00	2.25	2.50	6.00
1 1/4	23.00	27.00	2.50	2.75	7.50
1 1/2	27.00	31.00	2.75	3.00	9.00
1 3/4	31.00	35.00	3.00	3.25	11.00
2	35.00	41.00	3.25	3.50	12.00
2 1/4	41.00	47.00	3.50	3.75	14.00
2 1/2	45.00	52.00	4.25	4.50	17.00
2 3/4	54.00	62.00	4.50	4.75	21.00
3	64.00	73.00	5.00	5.25	25.00
3 1/4	74.00	84.00	5.25	5.50	31.00
3 1/2	84.00	95.00	6.00	6.50	37.00
3 3/4	112.00	125.00	7.00	7.50	40.00
4	128.00	145.00	8.00	9.50	42.00
4 1/2	180.00	198.00	10.00	11.00	75.00
5	180.00	200.00	12.00	13.00	—

TO ALL WHO USE STEAM POWER.—We will put our Governor on any engine, and warrant it to prove sufficient for the purpose. We will charge for it, after a fair trial, if it does not, we will take it off at our own expense.

No charge for boxing.

M. C. & W. D. SMYLLIE,
Office, 139 N. Third St., Philadelphia, Pa., U.S.A.
Works, Bethlehem, Pa., U.S.A.

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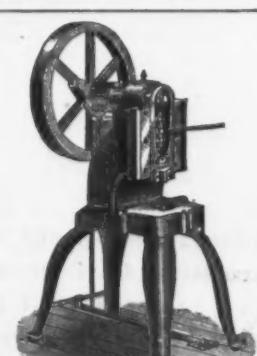
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Judges' Report.—"He exhibits a well-made, substantial machine, and contains several features of marked originality, which materially augment its durability and efficiency."



ASTONISHING POWER in FOOT and HAND PRESSES.

Punching, by foot, 3-4 hole in 5-16 iron 6 inches from edge.

Smaller sizes punch, by foot, 3-8 x 1-2, and 1 inch by 1-8, as rapidly as by power presses, at one-half the cost.

Our largest hand machine punch 1 inch hole in 3-8 iron, and shear bar 3-4 x 2 inches at a cut, any length, one man at the lever.

Highest prize, *The Grand Medal of Progress*, has just been awarded us at the American Institute Exhibition.

Our presses can also be run by steam power.

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52 Dey Street, New York City.LOVEGROVE & CO.,
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BOILERS & ENGINES, ALL SIZES.
1-HORSE ENGINE AND BOILER, \$150; 2-HORSE, \$175; 3-HORSE, \$200; 4-HORSE, \$250.
\$300; 4-HORSE, \$375; 5-HORSE, \$400; 6-HORSE, \$425.

WARRANTED THE BEST. SEND FOR CIRCULAR.



Machinery, &c.

Reduced Price List,
OCTOBER 15, 1878.

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No Charge for Boxing or Cartage.

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1 1/2	27.00	31.00	2.75	3.00	9.00
1 3/4	31.00	35.00	3.00	3.25	11.00
2	35.00	41.00	3.25	3.50	12.00
2 1/4	41.00	47.00	3.50	3.75	14.00
2 1/2	45.00	52.00	4.25	4.50	17.00
2 3/4	54.00	62.00	4.50	4.75	21.00
3	64.00	73.00	5.00	5.25	25.00
3 1/4	74.00	84.00	5.25	5.50	31.00
3 1/2	84.00	95.00	6.00	6.50	37.00
3 3/4	112.00	125.00	7.00	7.50	40.00
4	128.00	145.00	8.00	9.50	42.00
4 1/2	180.00	198.00	10.00	11.00	75.00
5	180.00	200.00	12.00	13.00	—

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